FACULTY OF AGRICULTURE AND FORESTRY

Export Competitiveness of Cameroon's Sawnwood Industry

Thesis submitted for a M.Sc. degree in Forest Products Marketing

Department of Forest Economics

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Tiivistelmä – Referat – Abstract

Cameroon is a country located in Central Africa. The country has an export-led economy, which means that the country highly depends on exports to ensure its population well-being. Sawnwood exports represent 14% of Cameroon's total exports. Sawnwood is therefore one of the most important export products for Cameroon.

Since Cameroon signed the EU-Cameroon voluntary partnership agreement policy in 2010, Cameroon's sawnwood exports were impacted. The aim of this study is therefore, to examine the export competitive performance of Cameroon's sawnwood industry from 2001 to 2017.

Based on the literature, a set of three methods analyzing the competitiveness of Cameroon's sawnwood exports were chosen. These methods are: The Revealed Comparative Advantage Index (RCA) and RSCA index which were used to analyze the competitiveness and international specialization of Cameroon in exporting sawnwood. The Spearman Rank Correlation was used to study the export competitive performance of Cameroon's sawnwood across years and to analyze the level of competition between Cameroon, Finland, China and Ghana. Lastly, the Constant Market Share Analysis was used to explain the drivers of Cameroon's sawnwood export competitiveness.

This study also compiles information on forest in Cameroon and provides an overview of Cameroon sawnwood industry, it can therefore serve as a base for further studies on sawnwood in Cameroon.

Results show that Cameroon has a competitive advantage and is the highest specialized in exporting sawnwood compared to Finland, China and Ghana. Nevertheless, the export competitive performance of Cameroon across years is not continuous and highly depends on external factors. Results also show that Cameroon has reduced its exports to EU and has diversified its importers portfolio by redirecting its exports trade flows towards Asia, especially China which has less stringent imports policies compared to EU. Cameroon will need to improve its production technologies and management practices to ensure a long run competitiveness on the global sawnwood market.

Avainsanat – Nyckelord – Keywords

Cameroon, Exports, Comparative advantage, sawnwood

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Helsinki, 23rd May 2019

Nguemgne Fotso Rostandine.

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LIST OF ACRONYMS AND ABBREVIATIONS (In Alphabetical Order)

%: Percent

CIFOR: Center for International Forestry Research

DDS: Due Diligence System

e.g.: example

etc.: And so on

EU: European Union

EUTR: European Union Timber Regulation

FAO: Food and Agriculture Organization

FLEGT: Forest Law Enforcement, Governance and Trade

FMU: Forest Management unit (Cameroon)

FSC: Forest Stewardship Council

GCR: Global Competitiveness Report

GDP: Gross Domestic Product

Ha: Hectare

IMD: Institute for Management Development

ITC: International Trade Centre

ITTO: International Timber Trade Organization

KM^2: Square Kilometer

m^3: Cubic meter

MINFOF: Ministry of Forest and Wildlife (Cameroon)

OEC: Observatory of Economic Complexity

OLB: Timber Origin and Legality

p.: Page (s)

TIDD: Timber Industry Development Division (Ghana)

Tons: refers to metric tons

UN COMTRADE: United Nations Commodity Trade Statistics Database

UN DESA: United Nations Department of Economics and Social Affairs

USD/US$: US Dollar

VPA: Voluntary Partnership Agreement

WCY: World Competitiveness Yearbook

WEF: World Economic Forum

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1. INTRODUCTION

1.1 Background

1.1.1 Exports As The Main Driver of an Economy

Since World War II, many studies have been conducted with the aim of increasing the economic growth of countries and nations competitiveness (Porter 1990, Porter 1998). Exports have proven to be a driver to economic growth and a generator of positive impact on development of economies and industrialization (Porter 1990, Porter 1998, Sandalcilar et al 2017...). Export-led economic theories therefore, agree with the idea that there is a positive relationship between international trade and economic growth (Adam smith 1776; David Ricardo 1817; Porter 1990 cited in Dong-Sung & Hwy-Chang 2013) and they highlight the fact that foreign exchange is important as it increases competition among nations, enhances the acquisition of new technologies, enhances specialization of nations in some exports products, and improves the domestic market by opening new market opportunities.(Porter 1990, Zeren & Savrul 2013; Sandalcilar & Dilek 2017).

Many export-led African economies, where economies are mostly based on the exploitation and exports of natural resources (e.g. Oil, wood) have therefore tried to improve the level of their exports, either through national planning and policies or due to international policies and recommendations (Bernstein & Cashore 2000; Gabon forestry law 2001; Cameroon forestry law 1999).

The forest sector for example, in most cases, contributes to a significant level of the national income of African economies: Gabon, Democratic Republic of Congo, Cameroon and Ghana (UN COMTRADE). Wood exports are therefore of vital importance to these economies.

Cameroon, as an African country whose economy is based on the exploitation and exports of natural resources is a good example of an export-led economy. This study will therefore focus on wood exports of Cameroon.

1.1.2 Case of Cameroon

Cameroon is a country located in Central Africa. The name Cameroon comes from “Rio dos camarões” which means “River of Shrimps”. This name was given by the Portuguese navigator

Fernão do Pó to the Wouri estuary in 1472. In fact, his visit coincided with the periodic migration of shrimps. The name was later extended to the whole country (Belda 2006).

From 12 July 1884 till the end of the First World War, the country is part of the German Empire. After World War I, the treaty of Versailles transferred the administration of the country to France and Britain as trusteeship territory (Belda 2006).

Among many other legacies of colonialism in Cameroon today, there are two national official languages which are English and French. As one will see afterwards, this legacy is reflected in the economic structure of the country.

The population of Cameroon is estimated at 24 678 234 inhabitants in 2018 (UN DESA) and the total surface area of the country is 475 440 KM². The economy of the country is mostly dependent on natural resources which are Oil, Timber, nickel, Bauxit, cobalt, magnesium, Iron, diamond and natural gas. Oil and Timber are economically the main resources this is because they make up more than 90% of the total revenue generated by the exploitation of natural resources (Mpenya et al. 2016).

The chart below shows the most recent top-10 exports of goods from Cameroon to the world.

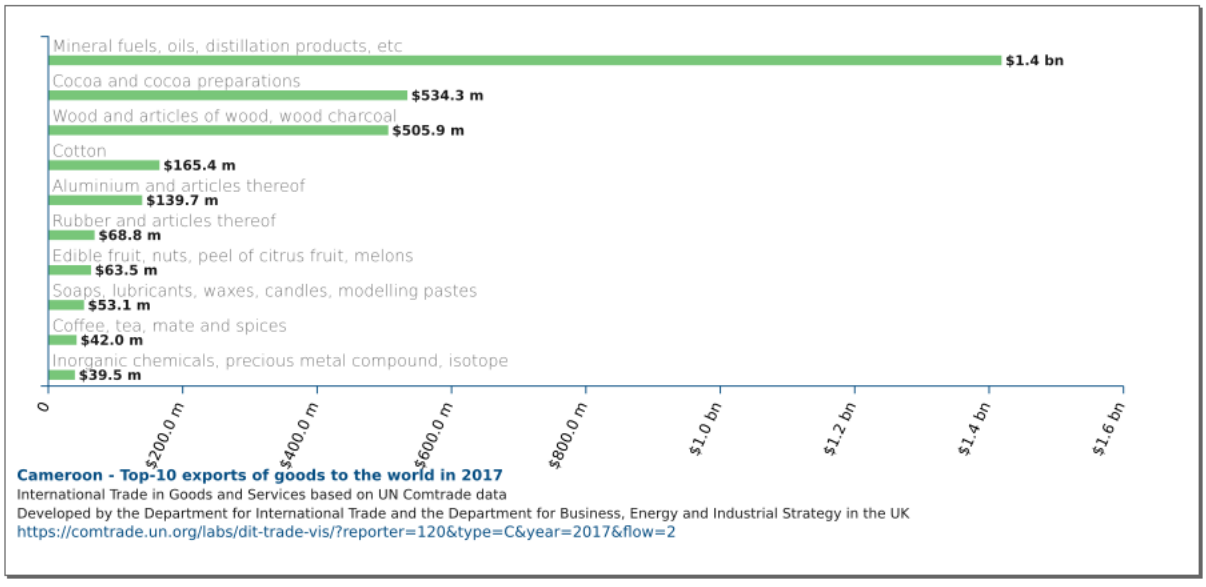


Figure 1. Cameroon's top-10 exports of goods to the world in 2017.

In 2017, mineral fuel, oils, wood-and-article of woods and cocoa are the main exported goods in Cameroon. They generated more than 2 billion dollars of exports revenue.

Among the sub-cited natural resources, this study will be focused on Timber; precisely Sawnwood.

Cameroon's exports of sawnwood represents 1.4% of the world exports of sawnwood and the country is ranked 16th among the exporters of sawnwood in the world (ITC calculations based on UN COMTRADE); Cameroon is also the 1st exporter of sawnwood in the Congo Basin region. (The Forest of the Congo Basin-State of Forest 2013, p. 50).

Exports of sawnwood is therefore an important source of revenue thus it can influence the economic growth of the country.

Demand, Supply and Prices of products; for example, Sawnwood, are highly influenced by the laws and regulations of the local and international market. For example, in 2003, the Forest Law Enforcement, Governance and Trade (FLEGT) of the EU Timber Regulation (EUTR) aimed at reducing illegal logging by ensuring that illegal wood is not sold into EU's markets (European Commission, 2003). Consequently, Cameroon whose market share in EU markets are endangered by the law had to or attempt to comply with the EUTR.

The process of compliance to EU timber regulation has certainly had an effect on Cameroon sawnwood export towards EU countries and an impact on the country's economy.

The following section will describe the trend of Cameroon's sawnwood production, exports and prices for the last 16 years.

1.1.3 Production, Exports and Prices of Sawnwood in Cameroon

Production of Sawnwood

It is difficult to assess exactly how much quantity of sawnwood is produced every year in Cameroon. Firstly, because a great part of the national production comes from informal sources, thus not accounted for (Lescuyer et al. 2017). A study made by Hoare (2015) concludes that 34% of timber from Cameroon is illegal. The other reason is that, the total production is not aggregate or not made available by national authorities. Nevertheless, FAO stated that the production of sawnwood in Cameroon for the year 2017 amounted to 1 022 000m3; another way to have an idea on how much was produced is to analyze the imported quantity declared by trade partners. This method is used by UN COMTRADE or ITC when the country does not report its trade statistics.

Exports of Sawnwood

Sawnwood exports represent 14% of the total exports in Cameroon, just after crude petroleum (OEC website 2019).

The following is a chart describing the principal sawnwood export destinations in Cameroon.

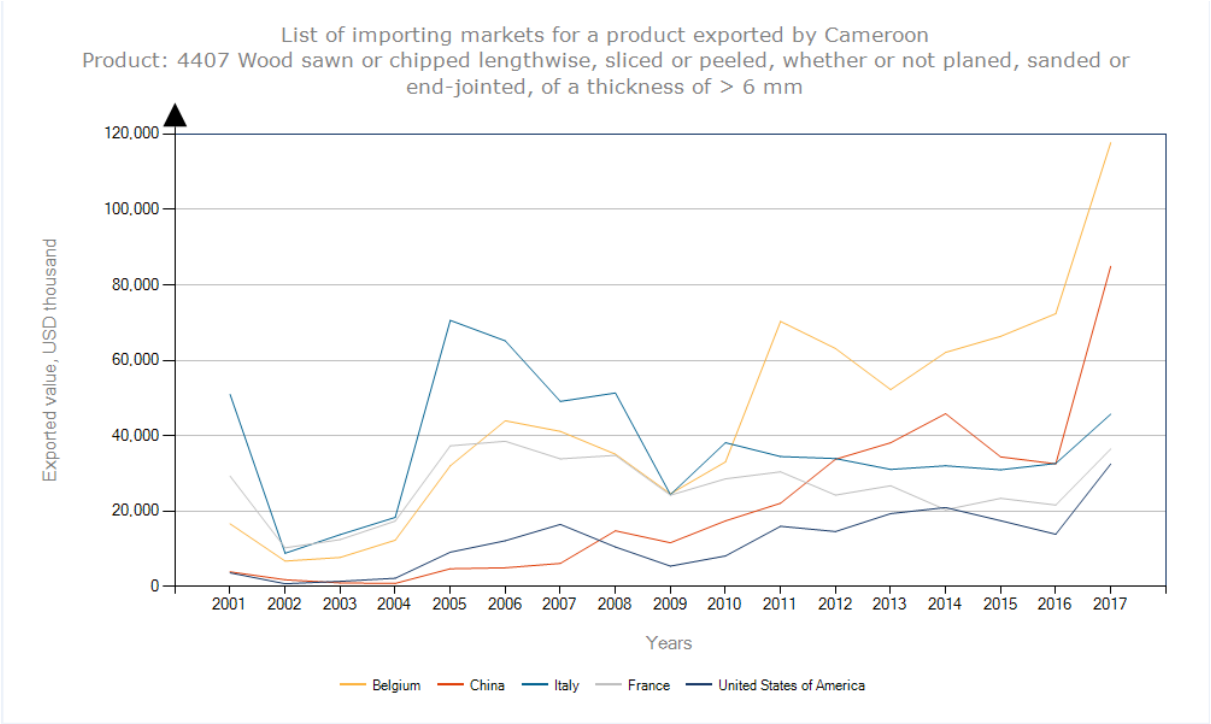


Figure 2. 5 principal destinations countries for Cameroon's sawnwood (in value).

Source: ITC UN COMTRADE https://www.trademap.org

The main destinations of sawnwood exports are Belgium, Italy, France and United States. Belgium is the top Cameroon's sawnwood export destination with imports amounting to 117,701 thousand dollars. China is the second top destination with sawnwood imports reaching 84,932 thousand dollars.

Aside from Belgium whose sawnwood import has increased steadily each year, for China, Italy, France and United States, the import of Cameroon's sawnwood has dropped from 2014 to 2016 and since 2016 then has increased steadily.

A look at the top destination country taking in account the quantity (see Fig. 3.) instead of the value allows to discover two important importer partners for Cameroon which are Vietnam and Senegal.

The following is a chart describing the principal buyers (in quantity) of Cameroon's sawnwood.

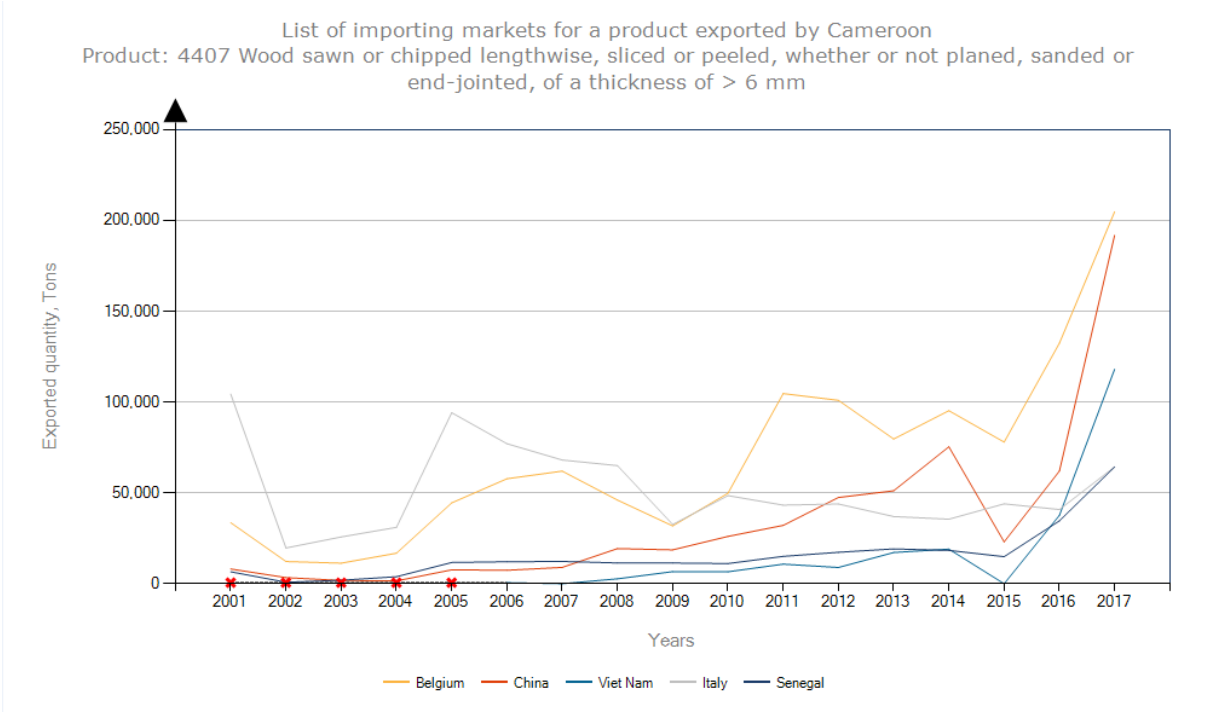


Figure 3. 5 principal destinations countries for Cameroon's sawnwood (in QTY).

Source: ITC UN COMTRADE https://www.trademap.org

There is a noticeable decrease of the exports of sawnwood in value and in quantity in 2009; this drop is a consequence of the economic crisis of 2008 and 2009 ;(Eurostat website 2018) which also affected sawnwood prices that year.

Prices of Sawnwood

Sawnwood's prices independent of the type of wood varied a lot during the recent years (see Fig. 4.), unit prices per ton vary a lot depending on the buyer. EU countries bought sawnwood from Cameroon at an average lower price compare to the rest of the world in 2015. In 2017 the average price of a ton of sawnwood was more expensive for EU countries compare to the world's price (ITC UN COMTRADE).

The following is a chart describing the evolution of Cameroon's sawnwood prices from 2001 to 2017.

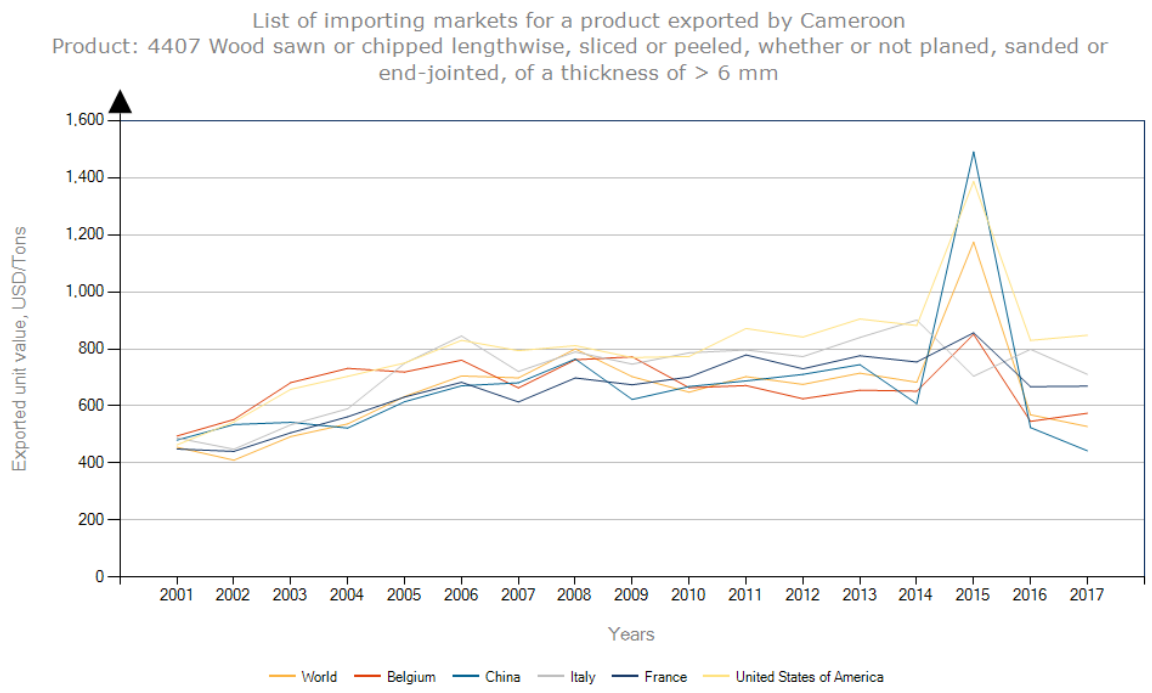


Figure 4. Sawnwood unit price/ton.

Source: ITC UN COMTRADE. https://www.trademap.org

1.2 Objectives of the Study

For sawnwood exports industry to sustain economic growth and Cameroon's population well-being (employment and social development), the industry should reach a significant level of competitiveness on local and international markets. The main objective of this study is therefore to understand the competitive performance of Cameroon's sawnwood exports and along the way, identify the factors affecting such performance.

Developing this study requires:

- Defining the competitive performance of the Cameroon's sawnwood exports appropriately to assist with the measurement and analysis of competitive performance;
- Measuring the competitive performance of Cameroon's sawnwood export using adequate analytical techniques;
- Proposing strategies that would improve the competitiveness of sawnwood.

1.3 Research questions

This thesis will be focused on an industry-level approach when it comes to defining the competitive performance and it will attempt to answer the following research questions:

- How can competitiveness be defined in the context of Cameroon's sawnwood export industry?
- What data and tools can be used to measure competitiveness? and how is Cameroon sawnwood exports competitive in a global context?
- How can Cameroon's sawnwood exports be improved?

1.4 Propositions

- Exports are positive drivers of competitiveness and export growth leads to economic growth;
- Wood exports in Cameroon and therefore the competitiveness of the country was influenced by the recent procurement policies and may be others factors such as global demand, exchange rate, firm strategy and trade arrangement;
- The competitiveness of sawn wood export in Cameroon is decreasing especially on EU market;
- Finland, China and Ghana are Cameroon's partners or competitors that can influenced sawnwood's international market.

2. THEORETICAL FRAME OF REFERENCE AND METHODS OF MEASURING COMPETITIVENESS

2.1 Introduction

The notion of competitiveness is integrated at every level of the evolution of the Theory of International Trade. The main theories of international trade will be described shortly starting from Adam Smith to Michael Porter; then will follow a presentation of few methods used in the literature when measuring competitiveness.

2.2 Theoretical Evolution of Competitiveness (From Adam Smith to Michael Porter)

2.2.1 Mercantilism

In the 15th century, international trade developed with the discovery of new merchant roads such as the road to the new world also known as Americas or the western road to India. Traders and merchants therefore found a way to expand their businesses.
The dominating theory at the time was mercantilism. The theory lasted until the 18th century.
Mercantilism theory stated that countries should export more than they import from other countries. The rationale behind it was that the savings generated by the positive difference between the exports and imports will allow the state to buy or to increase wealth which was at the time represented by metals such as gold and silver. Trade was therefore seen as a "zero-sum" game in which for a country to generate a surplus, another country must have as counterpart generated a deficit (Dong-Sung & Hwy-Chang 2013, p.4-5).

2.2.2 Absolute Advantage

The main critic of the mercantilism theory was that trade was view as "a zero-sum game in which a trade surplus of one country is offset by a trade deficit of another country" (Dong-Sung & Hwy-Chang 2013). Adam smith contradicted the mercantilism theory by stating in his book *Wealth of Nations* in 1776 that, trade was a "positive-sum" game; meaning that, each partner in the trade can have a positive return or benefit.

Adam smith also advised countries to sell goods in which they are best at producing; that is, to sell goods in which they have an absolute advantage and to buy from another country goods that will reveal to be more expensive for them to produce; thus, creating a specialization of countries. In order to be more competitive, he advised countries or firms to divide labor and henceforth improve their productivity and efficiency. He also advised for a minimum interference of government in trade arguing that individuals know best their needs and desire; that, in pursuing their egoistic welfare, individuals in the long run contribute most to the common good. Adam smith called this theory the "invisible hand". (Dong-Sung & Hwy-Chang 2013).

2.2.3 Comparative Advantage

David Ricardo (1817), provided a contribution to Adam Smith absolute advantage theory. The departure point of his theory was the question: What if there exist a country that is good at producing both products? meaning, what if a country does not have any disadvantage at producing the product he needed. In this case, there would be no interest for such a country to trade internationally. This question reveals a shortcoming in Adam smith theory of absolute advantage. In his theory often called the Ricardian theory, David Ricardo suggested that such a country having absolute advantage on product over another country should specialize where it has the "greatest absolute advantage" and the inferior country should specialize where is has the least absolute disadvantage. (Dong-Sung & Hwy-Chang 2013, p.9-11). David Ricardo's suggestion is called the theory of comparative advantage therefore implying that any country could benefit from international trade.

2.2.4 Factor Endowments

The implication of the comparative advantage theory is that, there exist a difference in the productivity factors between countries which explain the predominance of a country on another. David Ricardo in his theory only consider Labor as the factor impacting the productivity of country; a consideration which is logical since the Ricardian theory is an amelioration of the Absolute Advantage theory. Nevertheless, two economists, Heckscher and Ohlin explained further the Ricardian theory by stating that countries have advantage due to factors that they can possess at a lowest price and countries will choose the goods they produce depending on

the factors required for their production. Heckscher and Ohlin's model (H-O model) therefore introduced capital as another factor to consider in the production of goods with the assumption that each country possesses the same level of technology. Production is therefore a function of capital, labor and technology:

P= f (K, L, t)

With K=capital, L=labor and t=technology

H-O model is later expanded by theorems such as the Factor Price Equalization theorem, the Stolper-Samuelson theorem and the Rybczynski Theorem; and criticized by study such as the Leontief Paradox which when applying H-O model found out contradictory results (Dong-Sung & Hwy-Chang 2013, p.11-14).

2.2.5 The Diamond model of Michael Porter

Michael Porter criticized the old traditional models. According to him they were at their best incomplete or at their worst incorrect (Dong-Sung & Hwy-Chang 2013, p.62)

According to Michael Porter (1990), the industry of a nation is successful at the international level if it possesses competitive advantage compared to the best competitors in the world.

The competitive advantage is sustained through innovation. Porter continued by saying that, the home environment of a successful competitive industry has in fact provided with conditions such as factors, demand, firm strategy and structure, government and chance that have supported the industry favorably.

Porter (1990) suggested that a nation can achieve competitive advantage if it possesses 4 interlinked attributes that are also called the Diamond of national advantage; those attributes form a system since the state of one depend on the others. These attributes are:

1. **Factors conditions.** Principally production factor in an industry such as skilled labor, land, natural resources, capital, and infrastructure: a nation can achieve competitiveness if it is much easier or cheaper compare to others for such nation to possess resource and skills for production.

   Porter's model is sometimes referred as using a productivity-focused approach (Korhonen 2016).

2. **Demand conditions.** The nature of the national demand for a given industry's product will enhance or not the international competitiveness of that nation: demand conditions are the ultimate drivers or motors to innovation and specialization for firms (Porter 1990, Korhonen 2016). For example, the national demand gives companies ideas about

emerging buyer needs and "create pressure for innovation "(Dong-Sung & Hwy-Chang 2013, p.85)

3. **Related and Supporting Industries.** The presence or not of related and supporting industries will be a decisive factor that will provide either competitive advantage or a handicap to nations.
4. **Firm Strategy, structure and Rivalry.** Policies at State and corporation level as well as the domestic rivalry will influence the competitiveness of a nation.

The following figure by Michael Porter describes the determinants of a national competitive advantage.

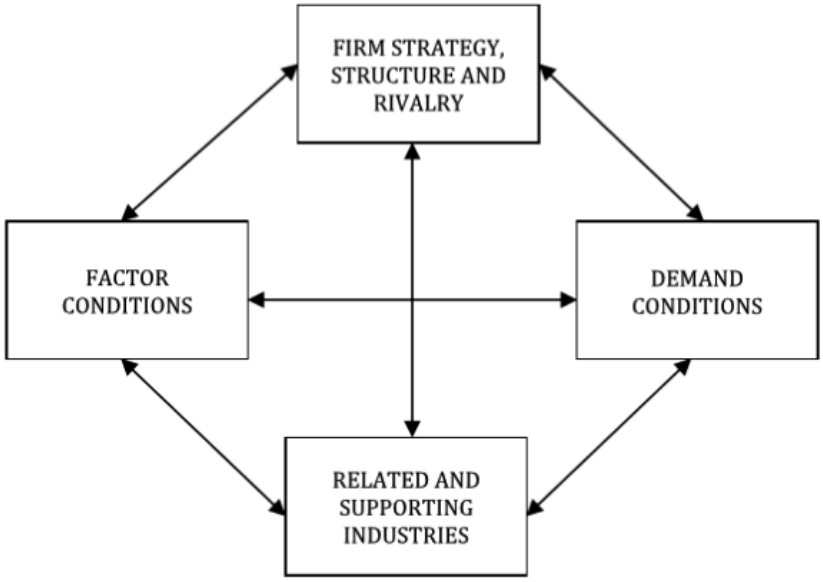


Figure 5. Determinants of national competitive advantage (Porter 1990).

Porter diamond model has been criticized for not being convenient for small export – driven economies; Alan Rugman (1991) argues that Porter "s diamond model does not incorporate multinational activities, that international rivalry and foreign markets can be important variables for competitiveness. Rugman and D'Cruz (1993) proposed the Double Diamond Model. They suggested that managers should build a diamond model both for the domestic market and international market in order to be globally competitive and to enhance their growth and profitability. Therefore, the competitiveness of a nation will depend on one hand, partially upon the domestic diamond and on the other hand, partially on the international diamond relevant to its firms.

Paul Krugman (1994) argues that, competitiveness is a misleading concept and an obsession. He highlights that competitiveness can lead governments to waste of money in order to enhance it; that it could lead nations to protectionism and trade war and that finally competitiveness can be the source of bad public policy. In fact, according to Krugman, competitiveness alone is not enough to induce decision making at the national level.

2.3 Competitiveness, Comparative Advantage, Competitive Advantage

In this section, different definitions of competitiveness proposed by authors will be enumerated and the relationship between international trade and competitiveness will be highlighted.

The theory of comparative advantage can be static or dynamic; in any case, comparative advantage focus on the role of cost and price in a competitive market while the concept of competitive advantage in comparison, in addition to cost and prices, is a dynamic concept that consider "non-cost /price factors under imperfect competition and oligopolistic market structure" (Shafaeddin 2012).

The terms competitive advantage and comparative advantage are most of the time used indistinctly in the literature when it comes to measure competitiveness (Serin & Civan 2008, Wan 2014, Korhonen 2016, Viet et al. 2017). According to Porter (1990), an industry is internationally competitive if it possesses a competitive advantage relative to the best competitors worldwide. This description of what a competitive industry is; when put side by side with the definition of comparative advantage proposed by Serin & Civan (2008) who stated that comparative advantage is "the term used to describe the tendency for countries to export those commodities which they are relatively adept at producing, vis-a-vis the rest of the world"; can help to conclude that an industry is competitive internationally when it possesses a competitive advantage at exporting the commodities which the country is the best at producing compared to its competitors.

Porter (1990) said that to remain competitive, an industry will need to sustain its competitiveness by always innovating and; the quest for innovation in an industry will inevitably lead to an improvement of the domestic economy. Between other improvement an increase of the level of productivity and income. Therefore, as the domestic economy improve as internationally competitive is that industry. Dong-Sung & Hwy-Chang (2013) agreed the more when they said: The fearless the “battle” on the international market, the faster will the domestic economy improves its technologies and management practices. The authors also

argued that countries which are not competitive on the international market will not be productive at home.

As competitive advantage and comparative advantage seems to be terms used indistinctly or terms that complete each other in the theories of international trade, the literature has not proposed a clear definition of competitiveness at the national level. Krugman (1994) went as far as to argue that Competitiveness is meaningless when applied to national economies. Though it is recognized that it is not as easy to define competitiveness at the national level as it is at the corporation level, there exist many propositions of definitions for Competitiveness at the level of a nation. For example, a report proposed to the Reagan administration in 1984 defined **Competitiveness of a nation** as "the degree to which it can, under free and fair market conditions, produce goods and services that meet the test of international market while simultaneously expanding the real income of its citizens. Competitiveness at the national level is based on superior productivity performance" (Dong-Sung & Hwy-Chang 2013).

Laura D'andrea Tyson in Who's Bashing Whom? defined **Competitiveness** of a nation as "the ability to produce goods and services that meet the test of international competition while the citizens enjoy a standard of living that is both rising and sustainable" (Dong-Sung & Hwy-Chang, 2013). Nowadays, the definition of competitiveness reveals to be more holistic. For example, The World Economic Forum (WEF) (2015, p.4), defines **Competitiveness** at the national level as "the set of institutions, policies, and factors that determine the level of productivity of an economy"; while the IMD World competitiveness yearbook (2015) defines **competitiveness** as the ability to manage all resources and competencies in order to facilitate the creation of value on the long run (Korhonen J. 2016).

According to Reinert (1995) national competitiveness is limited to activities where "being competitive" in the micro sense simultaneously increases the national standard of living. He sees competitiveness as an element and means of development.

2.3.1 Competitiveness at the Industry Level

D'Cruz & Rugman (1992) defines Competitiveness at the firm level as the ability to design, produce, and/or market products superior to those offered by competitors, considering price and non-price qualities.

National competitiveness can be seen as a "bottom -up "process where the competitiveness at the industry level builds grounds for competitiveness at the firm level. Korhonen (2016) adapted

Porter diamond model to the bottom-up perception of competitiveness at the industry level to integrate the prominent role that government can sometimes play to create competitiveness.
The following picture describe Porter's diamond and gives a bottom-up view on competitiveness.

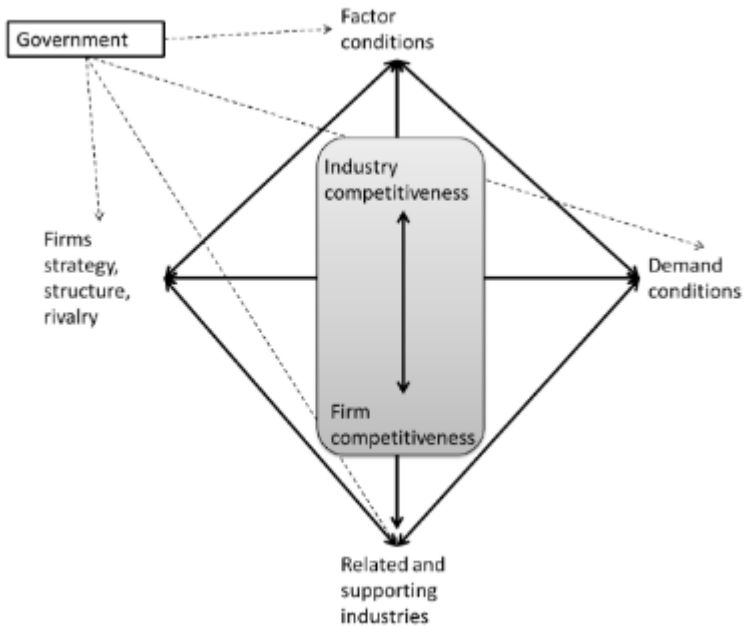


Figure 6. Porter's Diamond and the Bottom-up View on Competitiveness Based on Porter 1990 (Korhonen, 2016).

Despite its criticism, Porter's model can be used to analyze the international competitiveness of an industry, in our case the international competitiveness of Cameroon sawnwood industry.

2.4 Methods of Measuring and Analyzing Competitiveness

Academics agreed to measure competitiveness using relative terms accompanied by a dynamic component allowing future prospects. The difficulties in measuring "competitiveness of a referred subject" lies in the fact that drivers at the source of long–terms difference in performance of nations have not been well understood (Korhonen J. 2016).
In any case, according to (Viet et al. 2017), competitiveness has been assessed so far using frameworks depending on different disciplines which are:

- Economic indicators
- Trade performance measures
- Determinants of competitiveness
- Multidimensional frameworks

- Benchmarking and value chain performance.

2.4.1 Macro level of Measurement of Competitiveness

The Institute for Management Development's World Competitiveness yearbook (WCY) and the World Economic Forum's Global Competitiveness index are the most used measures of competitiveness at the macro level (Abei 2017).

The world Competitiveness yearbook rank countries taking in account economic performance, government and business efficiency and finally infrastructure. Using data from private, national and international institutions, as well as annual executive surveys, the WCY is able to provide for countries an analysis of how efficient nations are at using all their resources to achieve prosperity (Abei 2017).

The Global Competitiveness Index published in the Global Competitiveness Report analyses the performance of about 140 countries on 12 pillars of competitiveness. Based on empirical and theoretical research, the index assesses the factors and institutions that determines enhancements in productivity and henceforth economic growth and prosperity. The aim of the Global Competitiveness Report (GCR) is to help the decisions makers to understand the complexity of development challenges for them to design better policies taking in account all stakeholders (GCR2017-2018).

The measurement of competitiveness at the macro level has been criticized to give a holistic and overall comprehension of the competitiveness of a country while firms and industry tends to compete with one another (Kennedy et al. 1997).

2.4.2 Operationalization Measurement of Competitiveness in Literature at Micro Economic, Industry and Firm Level

when measuring competitiveness at the industry level, academia usually focusses on elements of competitiveness such as comparative advantage and competitive advantage. As mentioned in the point 2.3, the methods used to measure these elements are the same, and between comparative and competitive advantage, the difference can be negligible depending on if or not there is an interest on non-cost/price factors; as a reminder, a country has a comparative advantage when it is good at producing a product compared to other countries. Comparative

advantage and competitive advantage are therefore indistinctly used when it comes to evaluate competitiveness (Serin & Civan 2008, Wan 2014, Korhonen 2016 and Viet et al. 2017).
The literature provides different methods to measure competitiveness at the industry level. Thus, the most common indicators used to analyze competitiveness are:

2.4.2.1 The Revealed Comparative Advantage Index (RCA)

Also called the Balassa index proposed by Balassa B. (1965); it was the first method ever used to measure international trade specialization (a country specializes on product in which it has a competitive advantage). The Balassa index has been studied a lot and got criticize. As a result, extensions or other versions of the Balassa index have been proposed such as the logarithm of RCA proposed by Wollrath (1991) or the Revealed Symmetric Comparative Advantage (RSCA) proposed by Laursen (1998). The following is a non-exhaustive list of the literature on the Balassa index and its different extensions.

Papers	RCA and extensions
Balassa B. (1965)	RCA index
Wollrath (1991)	Logarithm of RCA index
Laursen (1998)	Revealed Symmetric Comparative Advantage
Proudmand and Redding (1998)	Arithmetic Mean of RCA index
Hoen and Oosrerhaven (2006)	Additive RCA index index
Yu et al.(2009)	Normalized Revealed Comparative Advantage index

The only variable needed to build the Balassa index is the Export.

As introduced, the RCA index is used to analyze the specialization trade pattern of a country. Hillman (1980) and Bowen (1983) are among the first authors who attempted to link RCA to the theory of comparative advantage. Nevertheless, the usual approach is to compare a country's shares to its international analog and introduce the existence or not of a comparative advantage. Henceforth, the RCA index can be used for a cross-sector comparison, a cross-commodity comparison or a cross-country comparison (De Benedictis and Tamberi, 2001).

This study will focus on a cross-country comparison.

The RCA's formula proposed by Balassa (1965) is as followed:

$$RCA\ [cst/w] = \frac{\frac{Xcs}{Xc}}{\frac{Xws}{Xw}} \equiv \frac{\frac{Xcs}{Xws}}{\sum\left(\frac{Xcs}{Xws}\right)*\left(\frac{Xws}{Xw}\right)} = \frac{\frac{Xcs}{Xws}}{\frac{Xc}{Xw}}$$

Where, ***X*** represents the total exports, ***c*** denotes a country, ***w*** goes for the world economy, ***s*** represents a specific sector, ***S*** the total number of sectors considered, and ***t*** is the time period considered.

In other words, the RCA index is calculated by normalizing a country's share of sectoral exports $\left(\frac{Xcs}{Xws}\right)$ over a weighted sum of exports shares in all the sectors ($\frac{Xc}{Xw}$)**.** RCA value ranges between 0 and $\frac{Xw}{Xc}$ which tends to ∞ when ***Xc*** tends to 0, that is when the economic weight of the country in terms of exports is irrelevant.

$\left(\frac{Xc}{Xw}\right)$ The denominator describes the economic dimension of country ***c***. Its value ranges from 0 to 1. The numerator $\left(\frac{Xcs}{Xws}\right)$ as well ranges from 0 (the country does not export the product) to 1(international monopoly); therefore, one can say that country ***c*** has a comparative disadvantage in sector ***s*** or commodity ***s*** if ***0<RCA<1*** while it has a comparative advantage in commodity ***s*** if ***1<RCA<*** $\frac{Xw}{Xc}$ (De Benedictis and Tamberi, 2001).

.

The Balassa index has been criticized in many ways:

- That the index is instead an export specialization index
- The index does not show how the comparative advantage change over time
- The index does not include import data
- the distribution of RCA is asymmetric and non-normal
- Its ranges from 0 to + ∞ and therefore make difficult to interpret and compare (Viet et al. 2017).

Because of the critics surrounding the Balassa index, authors preferred to use the Revealed Symmetric comparative advantage (RSCA) index proposed by Laursen (1998) which is a simple transformation of the Balassa index and this time it allows the comparison on both side of a neutral value which is 1 in this case, the formula is as followed (Oh et al.2015):

$$RSCAcs = \frac{RCAcs - 1}{RCAcs + 1}$$

RSCA index ranges from –1 to + 1.

If ***RSCAcs > 0:*** country ***c*** has a comparative advantage in the group of product ***s***

If ***RSCAcs < 0:*** country ***c*** has a comparative disadvantage in the group of product ***s***

In the recent years, Authors such as Seleka & Kebakile (2017), Jambor et al (2017), Setyari et al. (2016), Siddique et al. (2016), Sujova et al. 2015…have used the Balassa index associated with one or more extensions when measuring competitiveness. Nevertheless, there exist other measures of the international trade specialization; for example, the Michaely index, the Contribution to the trade balance, Chi-square or Bowen's net trade index.

2.4.2.2 The Constant Market Share Analysis (CMS)

The Constant Market Share analysis is also commonly used in the literature to measure competitiveness.

CMS analysis is a method used to examine the export growth and competitiveness of a country. The method consists of decomposing the export's growth or changing the market share in a country into components (Bonanno G. 2015). The contribution of each component in the result will facilitate the understanding of the relative importance of the various possible drivers of exports growth (John Gilbert. 2017).

The basic model of CMS was first used by Tyszynski (1951). Criticism of the basic model led to many revisions such as the ones proposed by (Leamer and Stern 1970, Richardson 1971, etc.) (Fagerberg & Sollie 1987).

The original version or the first revision of CMS analysis proposed by Leamer and Stern (1970) is commonly used in literatures. One of the reasons is that the original version provides a simple and comprehensive way to analyses export's growth patterns that can be complex; the other is that, by explaining reasons behind competitiveness, the version is a useful tool for export strategy's design (John Gilbert 2017).

Leamer and Stern (1970) proposed a three level of decomposition of exports' growth in values:

- The one-level decomposition explains exports growth value as a function of world growth effect and competitiveness effect.

- The two-level decomposition can be analyzed across commodities or across countries; it expresses exports growth value in terms of world growth effect, commodity/region effect and competitiveness effect
- Lastly, the three-level decomposition in CMS analysis proposed by Leamer and Stern (1970), decompose export growth in world growth effect, commodity effect, regional market effect and competitiveness effect (John Gilbert 2017).

Leamer and Stern (1970) decomposes exports into fours components which are:

- The general rise in world exports
- Commodity composition
- Market distribution
- And competitiveness effect also called residual (Tyszynski 1965)

Here is a schematic representation of the CMS model:

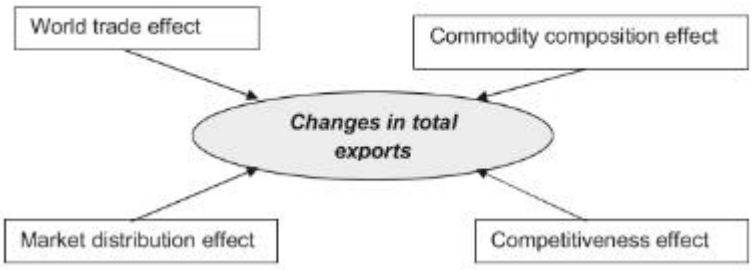


Figure 7. Schematic representation of the CMS model (Oh et al.2015).

A two-level decomposition formula of the Constant market share analysis based on Leamer and Stern (1970) is as followed:

Let ***a*** be a country, the exports of ***a*** is represented by X_a, the export value between two periods (0 and 1) is $X^1_a - X_a^o$

The growth rate in exports is g_a;

$g_a = (X^1_a - X_a^o) / X_a^o$ which is also the same as $X^1_a - X_a^o = g_a X_a^o$

If g is the value of world exports growth,

$g = (X^1w - X^ow) / X^ow$

Adding and subtracting gX_a^o from the right of the expression does not change the equation and gives:

$$X^1_a - X_a^o = g_a X_a^o + gX_a^o - gX_a^o$$

Arranging the precedent equation, the result is: $X^1_a - X_a^o = gX_a^o + (g_a - g) X_a^o$ which represents a one-level analysis of the constant market share.

For a two-level decomposition across commodities, the formula is:

$X^1_a - X_a^o$	=	gX_a^o	***(World growth effect)***
	+	$\sum_i (g_i - g) X^o_{ia}$	***(commodity effect)***
	+	$\sum_i (g_{ia} - g_i) X^o_{ia}$	***(competitiveness effect)***

Where, ***i*** represents a commodity and ***gi*** the world export growth rate of that commodity; g_{ia} is the growth rate of commodity ***i*** from country ***a*** and $\mathbf{X_{ia}}$ the export of commodity ***i*** from country ***a***.

If the **general increase in world exports** is positive, then the rise of exports is due to an increase of the demand

If the **commodity composition** is positive/negative, then the increase/decrease of exports is due to the growth rate of the commodities which is superior/inferior to the world's average.

If the **residual value** is positive it means that the increase of exports is the results of an increase in competitiveness (Oh et al.2015).

2.4.2.3 The Spearman Rank Correlation Coefficient

The analysis of competitiveness of an industry is usually carried out in an ex-post perspective. A trend analysis can therefore be proposed as to provide tools or elements for future competitive designs (Sujova et al. 2015).

Based on a study by Oh et al. (2015) evaluating the competitiveness of Indonesian wood-based product, the Spearman Rank Correlation Coefficient was chosen as indicator assessing trends of comparative advantage of an industry.

The spearman Rank correlation coefficient can be calculated across the years or across countries (Oh et al. 2015).

The spearman rank correlation (SRC) is used to study if there is a structural shift in comparative advantage. SRC therefore studies shifts in patterns of comparative advantages across time and countries. SRC coefficient is calculated as followed (Oh et al.2015):

$$\boldsymbol{Rs = 1 - \frac{6\sum di^2}{n(n^2 - 1)}}$$

Where:

Rs is the SRC coefficient between the revealed symmetric comparative advantage (RSCA) at a time ***ta*** and the RSCA at a time ***tb***

RS also represents the SRC coefficient between a country ***A*** at a time ***ta*** and a country ***C*** at a time ***tc***;

$\boldsymbol{di^2}$ represent the difference between ranks of RSCA;

n is either the numbers of commodities observed in the study or the number of years.

ta and ***tb*** are the years of observations.

The SRC value ranges between -1 and 1.

When SRC is calculated across years, a result of -1 describe a perfect structural shift or a structural shift in the comparative advantage and a result of 1 implies a perfect no structural shift; in other words, the comparative advantage is less dynamic.

A result of 0 means that there is no relationship between the variables observed.

2.5 Conclusion

The literature provides theories of international trade which have evolved across time from mercantilism to the determinants of national competitive advantage of Porter (1990) through the comparative advantage theory and the factors endowments theory (Dong-Sung & Hwy-Chang 2013).

Each theory has at its center the notion of competitiveness expressed in terms of comparative advantage when cost and price factors are taken into account or in terms of competitive advantage when in addition to cost/price factors, non-cost/price factor are considered.

The methods for measuring competitiveness therefore followed frameworks that can focus on either economic indicator, trade performance measures, determinants of competitiveness, etc. (Viet et al. 2017).

The macro level measurement of competitiveness is achieved through the IMD's world competitiveness yearbook and the WEF's Global Competitiveness index (Abei 2017) while the industry or firm's competitiveness is generally measured using methods such as the Balassa index (Balassa 1965), the Revealed symmetric comparative advantage (Laursen 1998), the Constant Market share analysis (Leamer and Stern 1970) or the Spearman rank correlation (Oh et al. 2015).

3. ANALYTICAL FRAMEWORK AND RESEARCH METHODOLOGY

3.1 Analytical Framework

To analyze the competitive performance of Cameroon's sawn wood export, this study will adopt a comprehensive and quantitative approach using internationally approved techniques and will follow the proceeding steps:

Step 1: defining competitiveness in the context of Cameroon sawn wood exports.

Step 2: measuring the competitiveness of Cameroon, Finland, China and Ghana's sawn wood exports and make comparison.

Finland, China and Ghana were chosen as counterparts for comparison for the following reasons:

Firstly, Finland is an EU country with almost the same amount of forest cover as Cameroon which is 22.8 million hectares (FOREST EUROPE 2015: State of Europe's forest 2015). The forest sector in Finland amount for over 4% of the national GDP (Statistics Finland 2017) likewise in Cameroon (see point 4).

As the EUTR comes to application, Finland which export ¾ of its sawn timber production (Finnish, Forest industry website) has an advantage on the European wood market since the country production is free from illegal logging. Finland represents 5.3% of the world exports of sawnwood (ITC UN COMTRADE) which is an important market share on the sawnwood global market. The intensification of the competition and the oversupply in the sawnwood

market makes it challenging for Finland to maintain its global market share (Natural Resource Institute Finland).

Then Ghana is a country located is West Africa where forested land amounted for 9.3 million hectares which are either primary or naturally generated forests (FAO 2015). Hoare (2015) estimated that 70% of Ghana production come from informal, small scale and artisanal production, thus is considered as illegal; that is the timber is harvested, purchased or sold in violation of national laws and policies.
Ghana signed in 2009 the VPA of the EUTR and is today on the final phase of its implementation which when concluding will open European wood market to the country.
In 2016, EU market represents 11 % of Ghanaian timber product; a downturn compared to the 50% that the EU market represented in 2004 which benefit to Asia which represented 73% of Ghana timber export volume in 2016 (TIDD).
Ghana has enhanced its wood processing capacity; coupled with a stable economy and political environment. Though Gnana exported 5 times less wood to EU compare to Cameroon (EUROSTAT 2017); Ghana has become a non-negligible partner and can positioned itself as a direct competitor for Cameroon on the international sawnwood market.

For Cameroon, Finland and Ghana's timber industry, China is an export destination. Though China produces sawnwood, most of its production is destined to the national market for construction or manufacture of building products. China customs estimation evaluated that China's total imports of sawnwood in 2017 amounted to 37.35 million cubic meters; there was an increase of 41% of soft sawnwood import that reached 25.05 million cubic meters and a decrease of 14% of its sawn hardwood import down to 12.30 million cubic meters (Global wood markets info website, May 2019).
China's competitiveness will be measured for understanding the competitiveness of an importer country and when necessary, be compared to Cameroon's, Finland's and Ghana's.

Step 3: using the information to make recommendations on how to improve sawn wood export in Cameroon.

3.2 Data

To analyze the competitive performance of Cameroon sawn wood export, secondary data for RCA measurement and trade performance analysis of Cameroon's sawnwood export were used. The data takes its source from open data available on https://comtrade.un.org/ and https://www.trademap.org which are websites of United Nations commodities trade statistics database (UN-COMTRADE).UN-COMTRADE database only compile data from 2001 to 2017.

The export competitiveness of Cameroon's sawnwood industry will therefore be studied from 2001 to 2017.

The exports of sawnwood are at a 4-digit level classification of the harmonized system of 1992 (HS92 products) from 2001 to 2017.

These sources were chosen firstly because they give trade statistics on the product or commodity at study which is sawnwood and secondly because the data were available for the studied period.

3.3 Methods

Based on the literature exposed in point 2.4, Three methods will be used to analyze the competitive performance of Cameroon's sawnwood exports. The same methods will be applied when calculating the competitiveness of Finland, China and Ghana. The methods were chosen because they were commonly used among researchers when it comes to examining competitiveness and because they provide results that are comprehensive and easy to interpret. These methods are:

1. **Revealed Comparative Advantage index** that will give Cameroon' shares of exports in the sawnwood international market and therefore Cameroon degree of international specialization in sawnwood's exports.
2. **The Spearman Rank Correlation** will give information about the existence or not of structural change in exports of sawnwood in Cameroon during the last 17 years and will reveal if there is any relationship or correlation between the competitive performance of Cameroon compare to Finland's, Ghana's and China's.
3. **Constant Market Share analysis** will give details on the source of competitiveness or not by decomposing Cameroon's exports of sawnwood.

4. FORESTS IN CAMEROON

4.1 Introduction

This point will give a general overview of Cameroon's forests followed by an understanding of the Cameroonian sawnwood industry. The aim entails placing Cameroon's sawnwood exports in sawnwood's global international market context.
The first part will consist of a general description of Forests in Cameroon. The second part will describe Cameroon forest industry and wood usage then a description of sawnwood exports and business in Cameroon.

4.2 Forests in General

Forests in Cameroon are mostly humid and are in the Congo Basin known as the second largest humid tropical forest zone after the Amazonia.

A report initiated by the World Resource Institute and presented by Global Forest Watch organization in 2000; named, "An overview of logging in Cameroon" presented details about the types of forests in Cameroon. According to this report, lowland evergreen Broadleaf Rain forest represent 56% of the total of forests; degraded forests represent 22% and Deciduous and semi-deciduous Broadleaf Rain forest represent 11% of forests in Cameroon. The following is a distribution of the different types of forest in Cameroon.

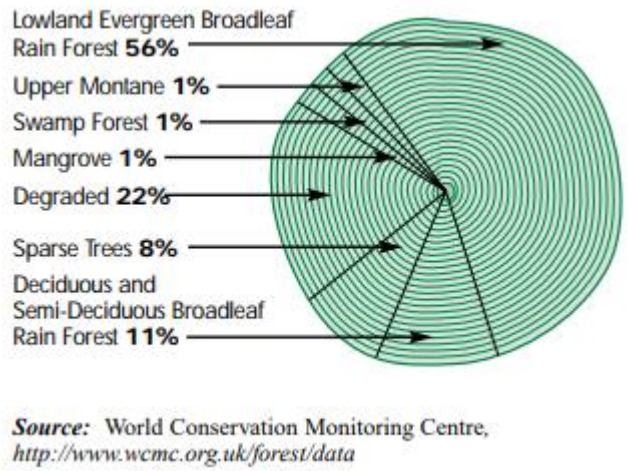


Figure 8. Types of forests in Cameroon.

Most of the forest cover in Cameroon is in the south-eastern part of the country. The humid forest in Cameroon represents 46.25% of the total land area and they are estimated at 22 million hectares which 17.5 million are exploitable forests and are divided in permanent forest domain for 11 506 400 hectares and non-permanent forest domain for 6 million hectares. The forest allocation also includes protected areas such as botanic gardens, national parks, reserves and sanctuaries; and zones with hunting interest. The total of protected area is 9 588 207.07 hectares (Ministry of forest and wildlife statistical yearbook 2015).

Forests in Cameroon are classified between permanent forest domain and non-permanent forest domain (see Fig. 9). Cameroon forest law of 1994 defines a permanent forest domain as a forest land that is solely used for forestry and/or wildlife habitat and a non-permanent forest domain as one that can be used for activities other than forest exploitation.

The following chart represents a classification of the different categories of classified forests in Cameroon.

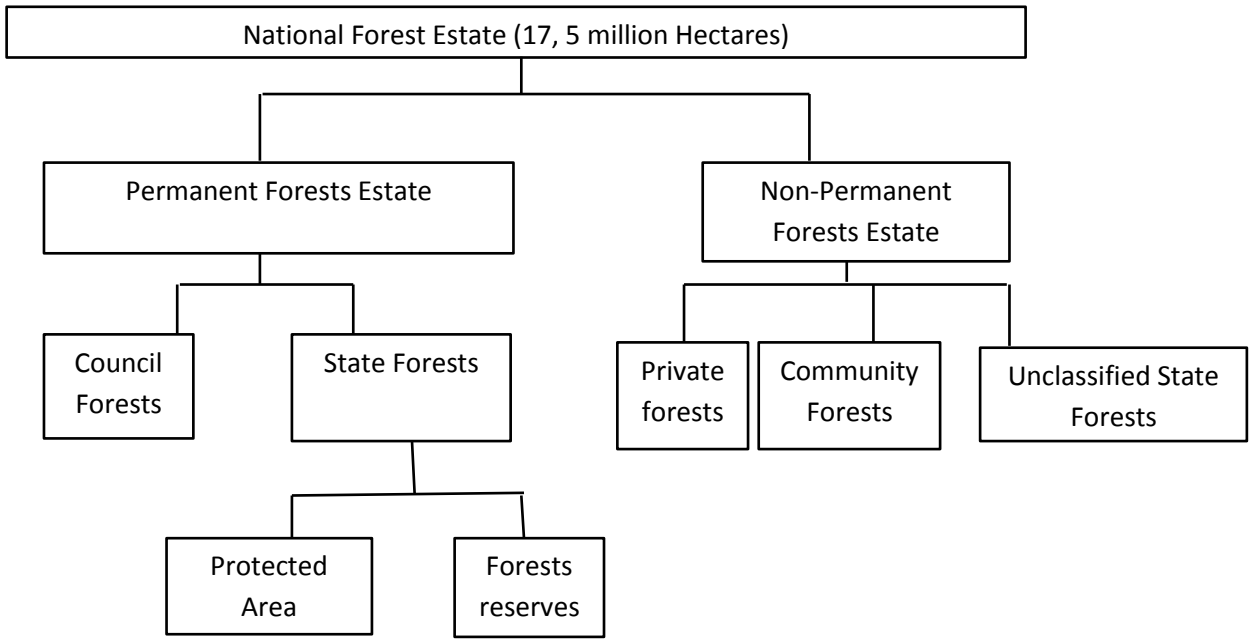


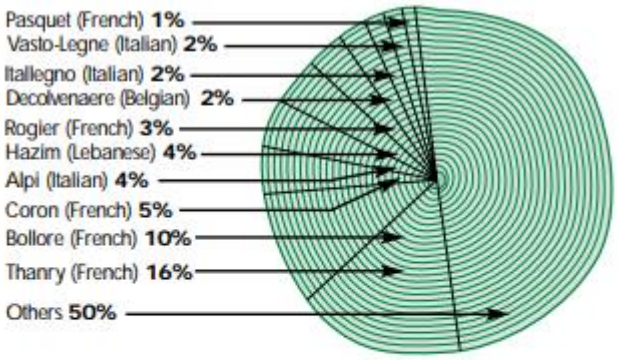
Figure 9. A status of different categories of classified forests in Cameroon (adapted from Foahom 2001 and Cameroon Forest law 1994).

4.3 Cameroon's Forest Industry

4.3.1 The Logging Industry in Cameroon: Ownership Pattern and Industry Investment

Before the economic crisis of 1986/1987, 71% of logging enterprises in Cameroon were foreign owned. This pattern diversified after the crisis by nationals and Chinese investors entering the logging industry (Atyi Eba'a 1998).

A report by Global Forest Watch giving an "Overview of logging industry in Cameroon" tells that for the years 1998, 1999, almost half of the logging companies in Cameroon were Italian or French by origin. The following figures describes the share and nationality of investments in Cameroon's forest industry and identifies the largest concession holder companies in Cameroon between 1998 and 1999.



Sources: GFW Cameroon based on data provided by SIGIF; Greenpeace International, *Buying Destruction,* (Amsterdam 1999); JC Carret (Personal communication, December 1999), Alain Karsenty (Personal communication, December 1999), Dominiek Plouvier (Personal communication, December 1999).

Figure 10.Share and Nationality of investment in Cameroon forest industry between 1998/1999.

French companies Thanry and Bollore were at the time the largest concessions holder in Cameroon; they held about 26% of the concession area which represented more than a million hectares of forest.

The following is a description of the largest concession holder in Cameroon in 1998/1999.

Table 1. Largest concession holder by surface area 1998/1999.

Company[a] (Subsidiaries)	Concession Area 1998-99 (Thousand hectares)	Percentage of Total Concession Area 1998-99
Thanry (CIBC, SAB, SEBC, CFC, Prenant)	650	16%
Bollore (La Forestière de Campo, SIBAF)	412	10%
Coron	212	5%
Alpi (Alpicam, Grumcam)	204	5%
Hazim (SFH)	157	4%
Rougier (SFID)	132	3%
Decolvenaere (SOTREF, SFIL)	75	2%
Itallegno (ECAM)	69	2%
Vasto-Legneault (SEFAC)	63	2%
Pasquet (Pallisco)	61	1%
Others	2,019	50%
Total	**4,054**	**100%**

Sources: Concession area calculated by GFW Cameroon based on data provided by SIGIF; Information on companies and subsidiaries derived from Greenpeace International, *Buying Destruction*, (Amsterdam 1999); JC Carret, CERNA (Personal communication, December 1999), Alain Karsenty, CIRAD (Personal communication, December 1999), Dominiek Plouvier, WWF Belgium (Personal communication, December 1999).

The logging group Thanry to whom 16% of the total concession had been allocated was later on (late 90's) acquired by a Hong-Kong based group. This acquisition marked the first Chinese investments in Cameroon logging industry (Cerutti et al. 2011). Another study (Tieguhong et al 2015), later on demonstrated that 11% of logging companies in Cameroon are 100% Chinese investment while 8% are companies with Chinese partnership.

4.3.2 Forest Management in Cameroon

The Forestry Law No. 94/01 of 20 January 1994 marked a corner stone in Cameroon forestry. This law established the basis for the forest management and took into account for the first time a sustainable management of the forest by giving a status to the different categories of forests but also describing their management options (Foahom B 2001).

Wood industry companies in Cameroon manage forests through concessions and utilization contracts; a concession can be divided in several Forest Management Units (FMUs) (Cameroon's forestry law 94). Forests are most of the time certified in Cameroon. The two types of certification schemes used in 2015 were: forest management certification also called FSC (Forest Stewardship Council) certification and legality certification (e.g. VLC: verification of legal compliance, OLB: Timber Origin and Legality) (Cerutti et al. 2016a).

The total area of FSC certified forests in 2015 amounted to 1 203 717 hectares (FSC Data base; 2015) and the amount of legally certified forest is estimated at 2 million ha in 2009 (Tieme

wanders, 2010) furthermore, today, according to Nature Economy and People Connected (NEPCon) website, the amount of legally certified forest has reached 3 million ha of forest.
In 2010, Cameroon ratified the voluntary partnership agreement (VPA) of the EU timber regulation (EUTR) which complies Cameroon to a due diligence system (DDA) for legality of imported wood product on Eu market. The aim of EUTR is to prevent placement of illegal wood on Eu market (Brusselaers & Buysse 2018). The compliance to the EUTR requires changes in forest management practices and is expected to impact forest governance and policies as well as being a driver of wood sector reforms in Cameroon (Cerutti et al. 2016b).

4.3.3 Employment

During mid-90's, Logging industry in Cameroon provided 33000 direct employments with low educational level since most of foreign companies preferred to hire foreign staff. (Atyi Eba'a 1998). In 2014, the ministry of forest and wildlife registered 150 000 employments mostly related to forest industrial exploitation and wood processing (MINFOF statistical year book 2014).

4.4 Wood Trade Exports and Business in Cameroon

4.4.1 Brief History

The exploitation of timber in Cameroon started at the end of 1960s and was mostly operated by French logging companies (Ndoye & Kaimowitz 2000, Belda 2006). According to (Foteu 1995), the timber production in Cameroon doubled from 602 394 cubic meters in 1965-1966 to 1 200 000 cubic meters in 1976.

From mid-1970s, Cameroon experience a rapid economic growth let by exports of coffee, cocoa and the oil boom from 1977 to1985. This economic growth increased the domestic timber demand which was mostly allocated to construction and the total timber harvested grew from 1.2 million cubic meter in 1976 to 2.1 million cubic meters in 1985. (Ndoye & Kaimowitz 2000, Wunder 2005). Furthermore, the end of the construction of the Transcamerounais railway around 1983, opened further the East province to timber exploitation and by 1986, the east province produces 55% of timber harvest and by 1992, 59% (Ndoye & Kaimowitz 2000, Van

Dorp 1995). However, the timber exports stagnated around 2 million cubic meters until the devaluation of the CFA Franc in 1994.

With the devaluation of the CFA Franc in 1994, the production cost of logging company increased by 34% and resulted to an increase in export volume from 2 million cubic meters in 1992 to 2.7 million, cubic meters in 1994. The number of species exported also rose from 40-50 species from 1987-1993 to 60-75 species from 1994-1996 (Ndoye & Kaimowitz 2000, Atyi Eba'a-1998).

4.4.2 Wood Exports and Destinations in Cameroon

Cameroon is rich in wood species. FAO stated that Cameroon has 600 species of wood; on which, 300 are marketable as lumber. Nevertheless, only 60 of them are exploited (FAO 2005). Principal Wood species are: Ayous (Triplochiton scleroxylon), Sapelli or Sapele (Entandrophragma cylindricum), Iroko (Milicia Excelsa or Chlorophora spp.), Tali (Erythrophleum ivorense), Azob (Lophira alata), yellow pine (Terminalia superba) and Moabi (Baillonella toxisperma); these varieties account for 80% of timber exploitation (environmental justice atlas website).

Cameroon has an export-oriented economy; the country is therefore relying on its natural resources to produce wealth and the facto insure the population livelihoods and wellbeing. The share of forest in the national Gross Domestic Product (GDP) accounted for 3.5% in 1989 (Atyi 1998); 6.7% in 1995; 12% in 2000 (Ekoko 1999, Brown and Schreckenberg 2001, Siebock 2002 cited in Atyi 1998) and 4% of GDP without fuel revenues (MINFOF 2015).

Most of the Country's timber production is sold in Europe, Asia and Africa:

4.4.2.1 Cameroon's Exports of Wood Products to Europe

The principal timber European export destinations are, Belgium, Italy, France and Spain (see Fig. 11.).

The following is a chart which describe the principal destination of Cameroon's wood products.

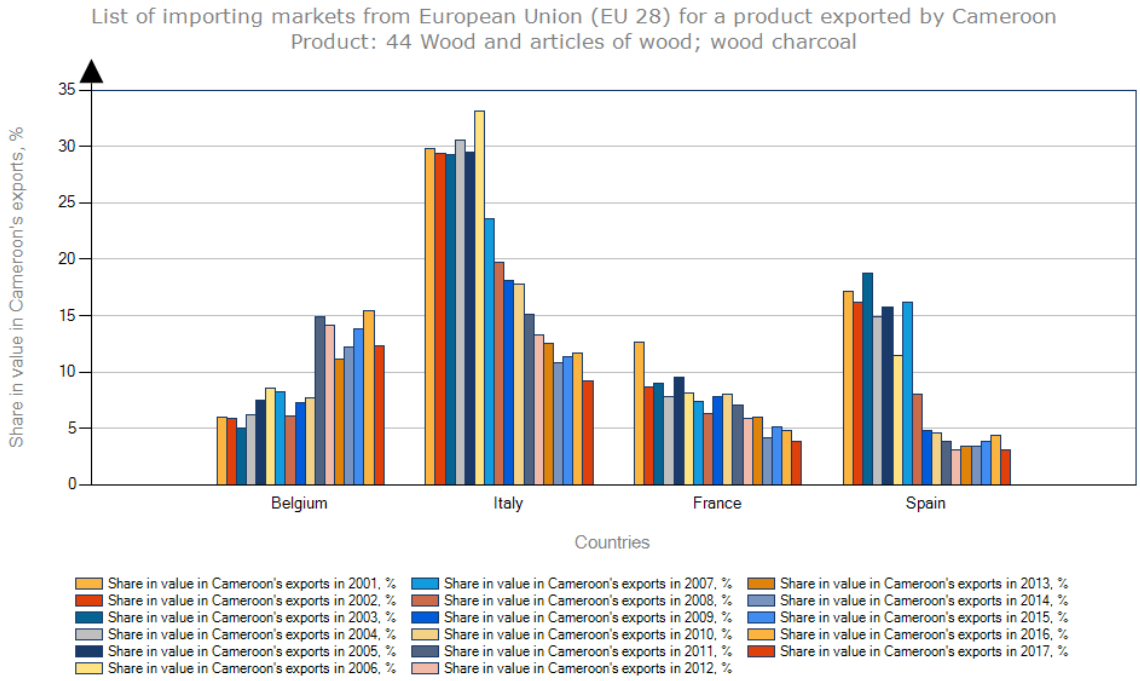


Figure 11. Share of principal EU importers in Cameroon's wood exports from 2001-2017.

Source: ITC UN COMTRADE https://www.trademap.org

Belgium, Italy, France and Spain are the main importers of Cameroon wood products.

Belgium imports of wood, wood charcoal and article of wood from Cameroon represented 6% of Cameroon's wood exports in 2001; this share rose to 15% in 2011/2016 and decreased to 13% in 2017.

Though Italy remain the second importer of wood products from Cameroon, its share in Cameroon's wood exports has consistently decreased over the years from 34% in 2006 to 9% in 2017.

France's share of import of Cameroon wood products also decreased over the years: from 13% in 2001 to 4% in 2017.

Spain also imported less wood products from Cameroon over the years, its share in Cameroon export dropped from 16% in 2001 to 3% in 2017.

Generally, the main European importers of Cameroon's wood products have seen their share in Cameroon's wood exports reducing drastically over the past 16 years.

4.4.2.2 Cameroon's Exports of Wood Products to Asia

Asia's main wood importers of Cameroon are China, Viet Nam, Turkey and Bangladesh (see Fig. 12.).

The following is a chart showing the main Asia's importer of Cameroon's wood products.

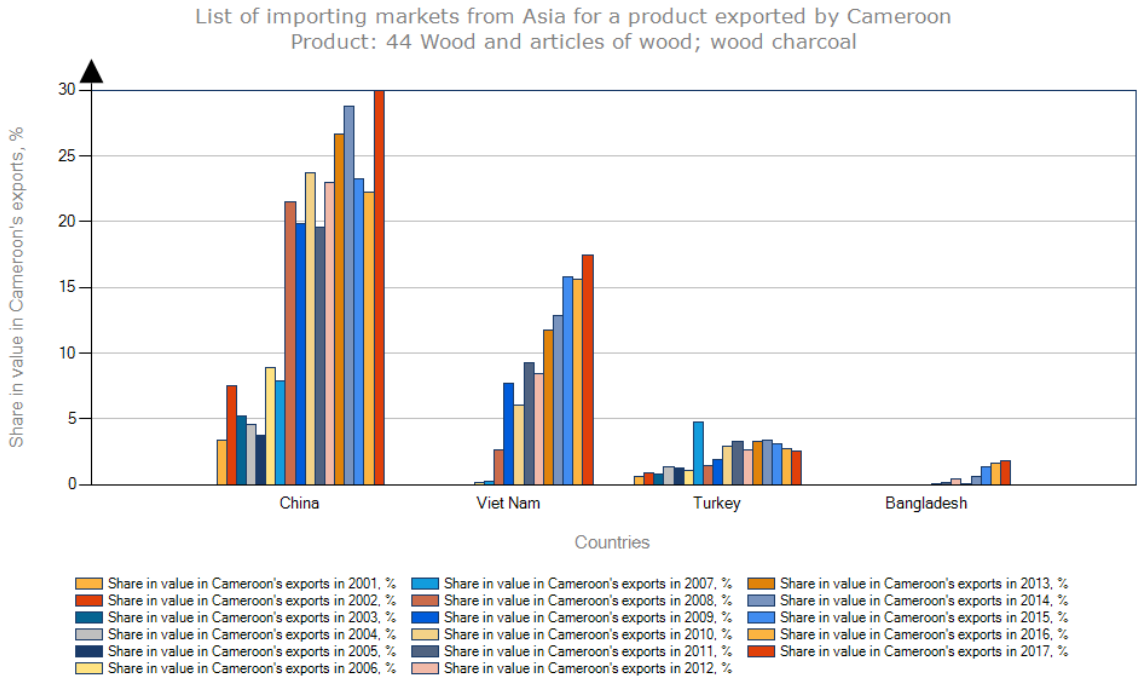


Figure 12. Share of principal Asia's wood importers in Cameroon's wood exports.

Source: ITC UN COMTRADE https://www.trademap.org

China is the first Asia's destinations for Cameroon's wood products. China's imports of wood product from Cameroon rose from 4% in 2001 to more than 30% in 2017.

Vietnam followed the same increasing trend as China. Its imports of wood product from Cameroon increased from 1 % in 2001 to 17 % in 2017.

Aside from a sudden rise from 2% in 2001 to 5% in 2007, Turkey's share on Cameroon's wood exports has been almost steady and represented 4% of Cameroon wood exports from 2006 to 2017.

Bangladesh's imports of Cameroon wood products represented around 2,5% of Cameroon's wood exports.

China and Vietnam are the main Asia's importers of Cameroon wood products.

4.4.2.3 Cameroon Exports of Wood Products to Africa

Within Africa, the exports destinations countries are Senegal, Chad, and Tunisia (see Fig. 13**)**. Africa's market represents 4.2% of Cameroon total wood exports; the principal wood demand comes from Senegal and Chad (see Fig. 13.) (ITC calculations based on UN COMTRADE statistics).

The following is a chart showing the main Africa's importers of Cameroon's wood products.

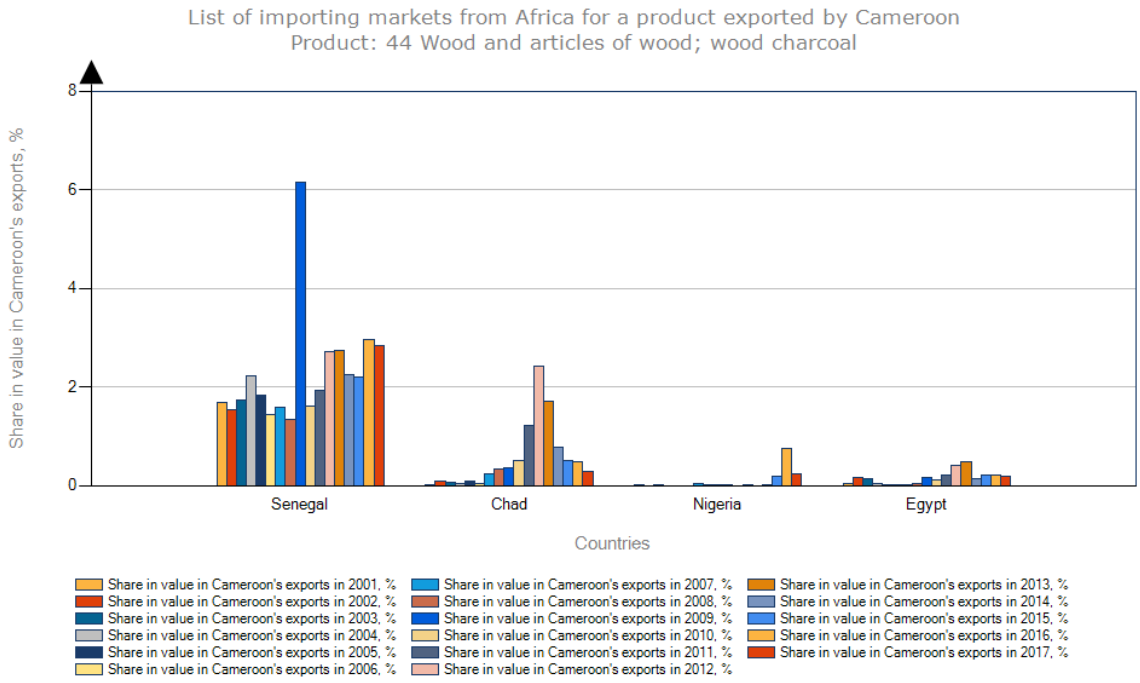


Figure 13. Share of principal African wood importers in Cameroon's exports.

Source: ITC UN COMTRADE https://www.trademap.org

Since 2011, Senegal's imports of Cameroon's wood products represent around 3% of Cameroon's exports.

Chad increased its imports of Cameroon's wood products from less than 1% in 2002 to 2.5% in 2012. The imports decreased from 2013 to reached 1 % in 2017.

Nigeria's and Egypt's imports of Cameroon's wood products remain low and represented less than 1% of Cameroon exports during the past years.

4.4.2.4 Evolution of Cameroon Exports of Wood Products Towards European Union

European Union's wood imports accounted for 86% of Cameroon's total wood exports in 2001. The imports share of EU in Cameroon's exports has steadily dropped each year to reach 36% of the country total export in 2017 (see Fig. 14.) (UN COMTRADE statistics).

The following is a chart describing the evolution of EU's wood imports in Cameroon.

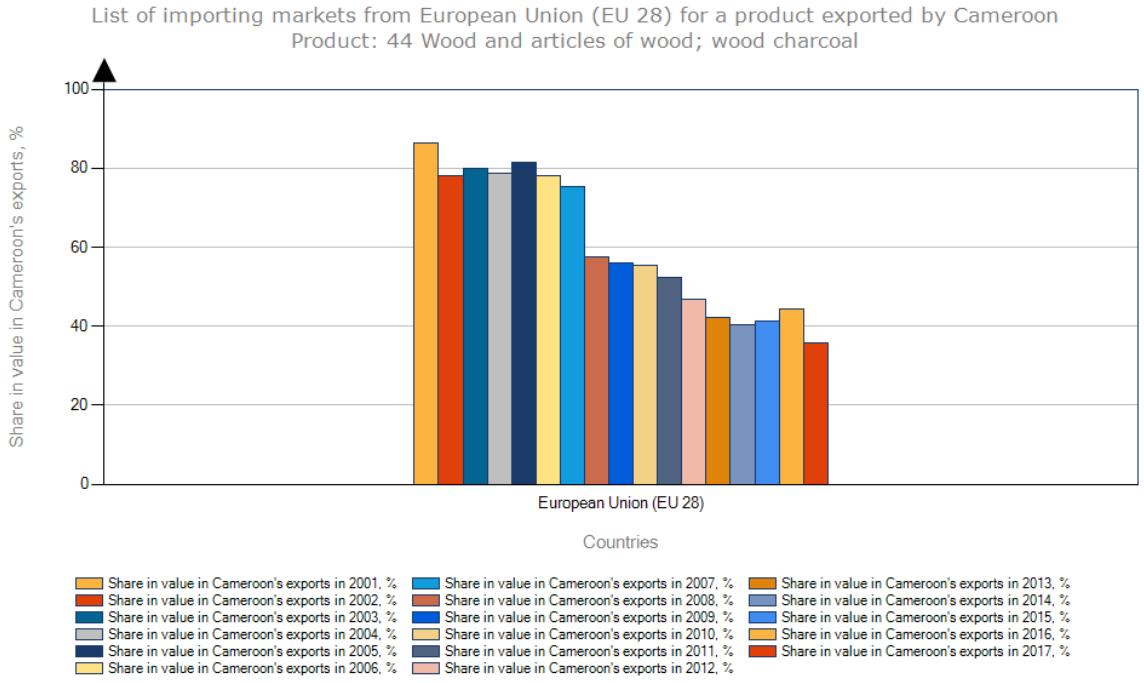


Figure 14. Share of EU in Cameroon's wood exports.

Source: ITC UN COMTRADE https://www.trademap.org

4.4.2.5 Evolution of Cameroon Exports of Wood Products Towards Asia

Asia's market represents 56% of Cameroon's wood exports today. China's share represents 30% of the total wood export in Cameroon (UN COMTRADE statistics).

As the ITTO annual review of 2010 pointed out, while Europe's import of Cameroon's wood and wood products has been steadily decreasing, the contrary is observed when compare to

Asia's which has steadily increased its share in Cameroon's wood exports (see Fig. 15.) (UN COMTRADE statistics).

The following is a chart describing the evolution of Asia's imports in Cameroon.

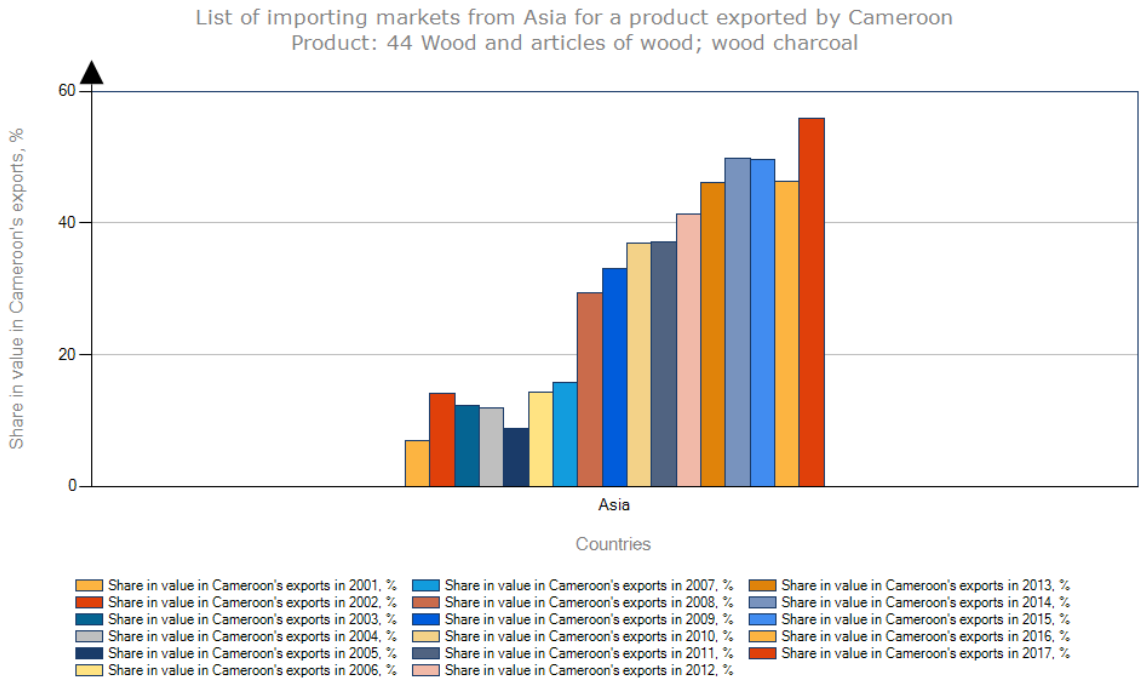


Figure 15. Share of Asia in Cameroon's wood exports from 2001-2017.

Source: ITC UN COMTRADE https://www.trademap.org

Busselaers & Buysse (2018) interpret the change observed between exports of wood product of Cameroon towards EU and Asia as a trade distortion that led to a redirection of trade flows. They argued their point by saying that the decrease of Cameroon wood exports to EU is due to stringent export conditions caused by the FLEGT of EUTR.

According to the harmonized system of classification of products of 1992 (HS92), Sawnwood products represented by the 4-digit level classification 4407 is a subdivision of 44: wood, article of wood, wood charcoal. Sawnwood exports represented 14 % of Cameroon's exports in 2017 (OEC website 2019). Therefore, sawnwood's export represents an important source of revenue and is a driver of economic growth in Cameroon. the next point will give a brief description of Cameroon's sawnwood production and national demand will be described then the new challenges of sawnwood exports will be highlighted.

4.5 Sawnwood

4.5.1 Definition of Sawnwood

According to FAO(2013), "sawnwood can be unplanned, planed, grooved, tongued, etc; the wood is sawn lengthwise, or produced by a profile-chipping process(e.g. plank, beams, joists, boards, rafters, scantlings, laths, boxboards, "lumber", sleepers, etc) or planed wood which may be also finger jointed, tongued or grooved, chamfered, rabbeted, V-jointed, beaded, etc. Wood flooring is excluded. With few exceptions, sawnwood exceeds 5mm. In thickness".

In fact, the definition used in this thesis describes sawnwood as wood sawn or chipped lengthwise, sliced or peeled, whether or not planed, sanded or end-jointed, of a thickness of exceeding 6 mm: This definition is proposed by UN COMTRADE.

4.5.2 Sawnwood Production in Cameroon

History of Sawnwood

The Cameroon forest law of 1994 favored domestic processing over exports of raw timber. Each company having then or biding for a concession was obliged by legal prescriptions to present proof of ownership of a running sawmill within the country. In addition, a partial logs exports ban on more than 20 species excluding Ayous became effective in 1999 (Cameroon Forest law 1999).

Consequently, the exports of logs dropped drastically from 1.8 million m3 in 1998 to 200 000 m3 in 2001. Following a different pattern, the exports of sawn wood tripled from 1995 to 2008 However, the processing remained rudimentary and the exports of other processed wood products such as plywood and veneer sheets remained low (Atyi et al.2013).

4.5.3 National Demand for Sawnwood in Cameroon

The national demand sawnwood in Cameroon is met by:

- urban markets which sell sawnwood in the forms of rafters, laths and planks. Around 830 000m3 of sawnwood is sold each year. The price of 1m3 of sawnwood on the domestic market is estimated at XAF 80 000 which is around $ 138.82 (Lescuyer et al. 2017);

- Joinery workshops, Furniture shops and Public contracts (Lescuyer et al. 2017).

Sawnwood production in Cameroon is affected by illegal logging, most of the illegal logging in Cameroon is said to come from the national market through small scale chainsaw mills since their production has been neglected and not recorded (Cerruti et al. 2011, Hoare 2015, Lescuyer et al. 2017).

Wood industries sometimes supply the national market with wood of low quality which could not be exported; but because their prices are higher than those in the interior market, their participation in supplying the local market is very low. Logging companies generally do not have management plan for the low-quality remaining products from their sawmills. This remains considered as illegal or informal, can be found out on domestic markets (Lescuyer et al. 2017).

The national demand of sawnwood is destined to construction in public work, frame and furniture. Most of sawnwood demand comes from the public administration thus, making the state of Cameroon the main customer for sawnwood's national demand.

4.5.4 Exports of Sawnwood in Cameroon

4.5.4.1 Exports of Cameroon's Sawnwood Towards EU

European Union is an historical wood trade partner for Cameroon. The ownership pattern of logging companies in Cameroon shows that an important share of investment belongs to EU nationals (see point 4.3.1).

Cameroon's sawnwood exports to EU has fluctuated a lot during the last 16 years (see Fig.16.):

The following is a figure describing Cameroon's exports of sawnwood to EU from 2001 to 2017.

Figure 16. Cameroon's exports of sawnwood to EU from 2001-2017.

Source: ITC UN COMTRADE https://www.trademap.org

From 2001 to 2002, Cameroon's sawnwood exports to EU decreased in value from $200 million to $50 million. then, from 2002 to 2008, EU sawnwood's imports from Cameroon rose from $50 million to $300 million. In 2008, certainly due to the economic crisis, EU imports of sawnwood dropped by half to reach $150 million. From 2009 to 2011, there was a shy recovery with the EU import which rose from $150 million to $200 million. When studying the effect of the implementation of EU-Cameroon VPA policy, Brusselaers & Buysse (2018) explained that the sharp recovery of Cameroon sawnwood export to EU before the implementation of the VPA (i.e. from 2010 to 2011) was due to a rent-seeking behavior from Operators who wished to buy sawnwood from Cameroon while the exports conditions were less stringent.

From 2011 to 2017, Cameroon's sawnwood export to EU decreased from $200 million to $150 million; this fall can be explained by the implementation of the EU-Cameroon VPA policy which came into force in December 2011 (Cerutti et al. 2016b).

4.5.4.2 Evolution of EU Imports of Sawnwood in Cameroon

Though EU's share of sawnwood's imports in Cameroon's wood exports remained important, it has generally decreased over the past 16 years (see Fig. 17.). This drop can be explained either by the economic crisis of 2008 which affected the purchasing power of historical

European importer countries such as France and Italy (see point 1.1.3) or by the EU-Cameroon VPA policy negotiations which started in November 2007 and ended in May 2010 and affected negatively Cameroon's exports to EU because of the uncertainty related to the outcomes of the negotiations and the redirection of trade flows from EU to Asia (Brusselaers & Buysse 2018).

The following is figure describing the evolution of EU's imports of sawnwood in Cameroon's total wood exports.

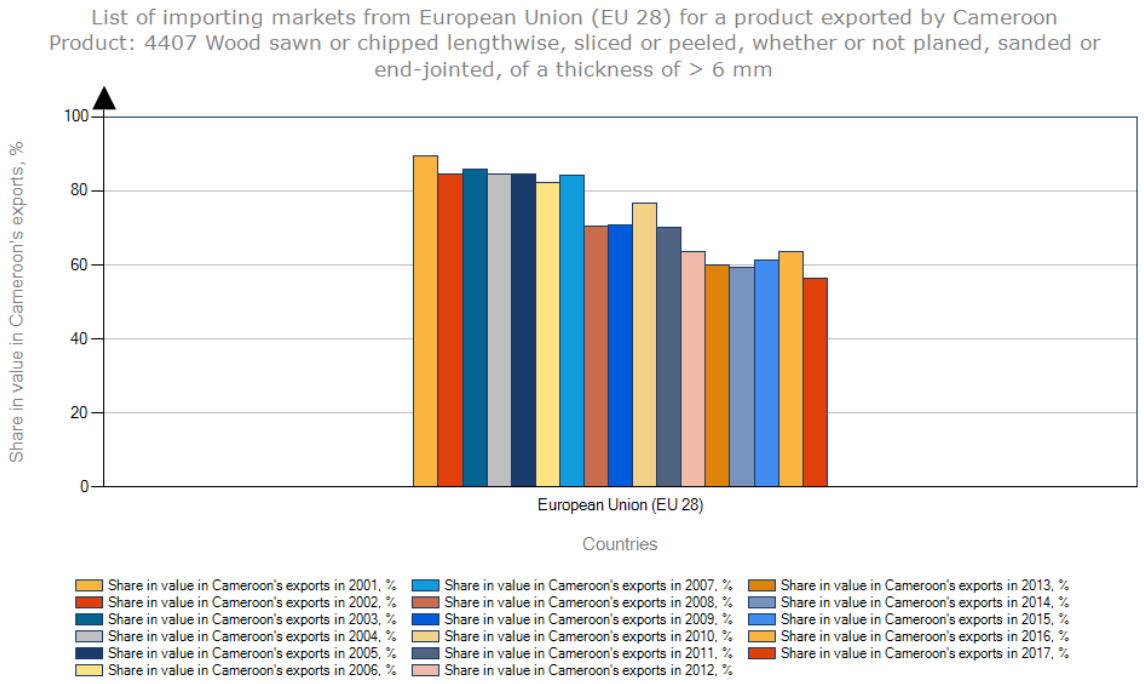


Figure 17. Share of EU imports of sawnwood in Cameroon's wood exports from 2001-2017.

Source: ITC UN COMTRADE https://www.trademap.org

EU's imports of sawnwood represented 86% of Cameroon's total wood exports in 2001. By 2017, EU's imports of sawnwood only represented 59 % of Cameroon's total wood exports.

4.5.4.3 Exports of Cameroon's Sawnwood Towards Asia

Cameroon's export of sawnwood to Asia has continuously increased from 2001 to 2017.

China remained the main Asia's importer of Cameroon's sawnwood followed by Vietnam, Turkey and Malaysia (see Fig. 18.).

The following is a figure describing the exports of sawnwood from Cameroon to Asia Countries.

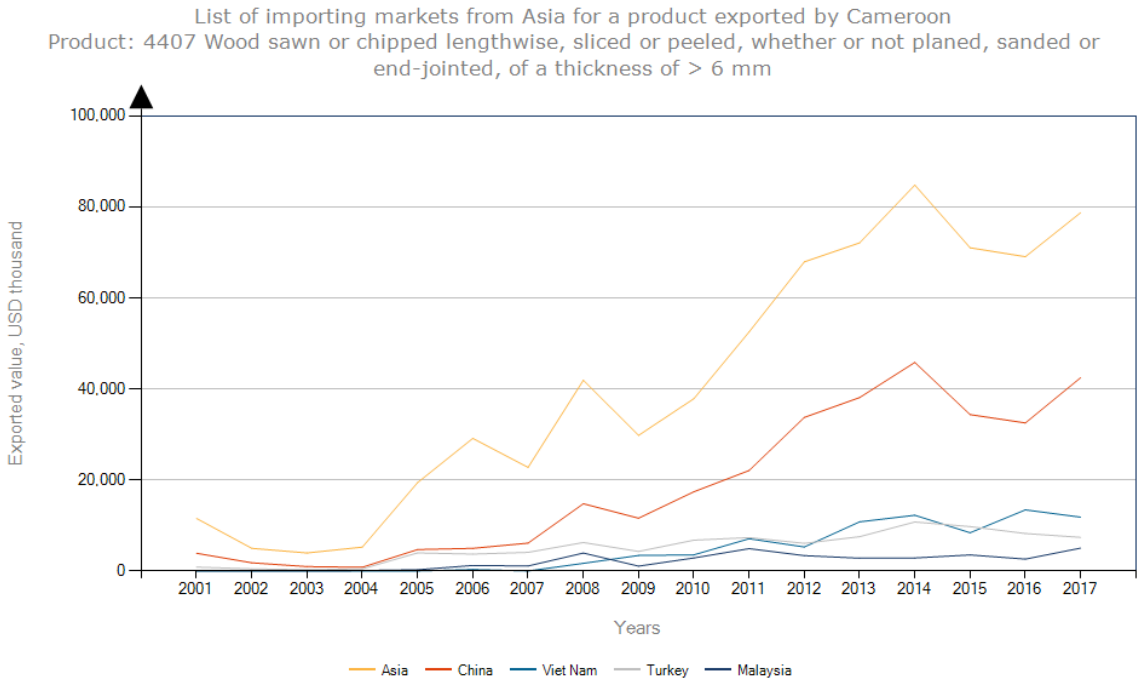


Figure 18. Exports of sawnwood from Cameroon to Asia's countries from 2001-2017.

Source: ITC UN COMTRADE https://www.trademap.org

Asia's imports of sawnwood rose steadily from $18 million in 2001 to $79 million in 2017. China is the biggest Asia's importer of Cameroon's sawnwood with imports which rose from less than $10 million in 2001 to a bit more than $40 million in 2017.

4.5.4.4 Share of Asia's Imports of Sawnwood in Cameroon's Exports

As Cameroon's exports of sawnwood towards Asia has increased over the past 16 years, so is the share of Asia's imports of sawnwood in Cameroon total wood's exports (see fig. 19).

The proceeding is a histogram describing the share of Asia in Cameroon's wood export.

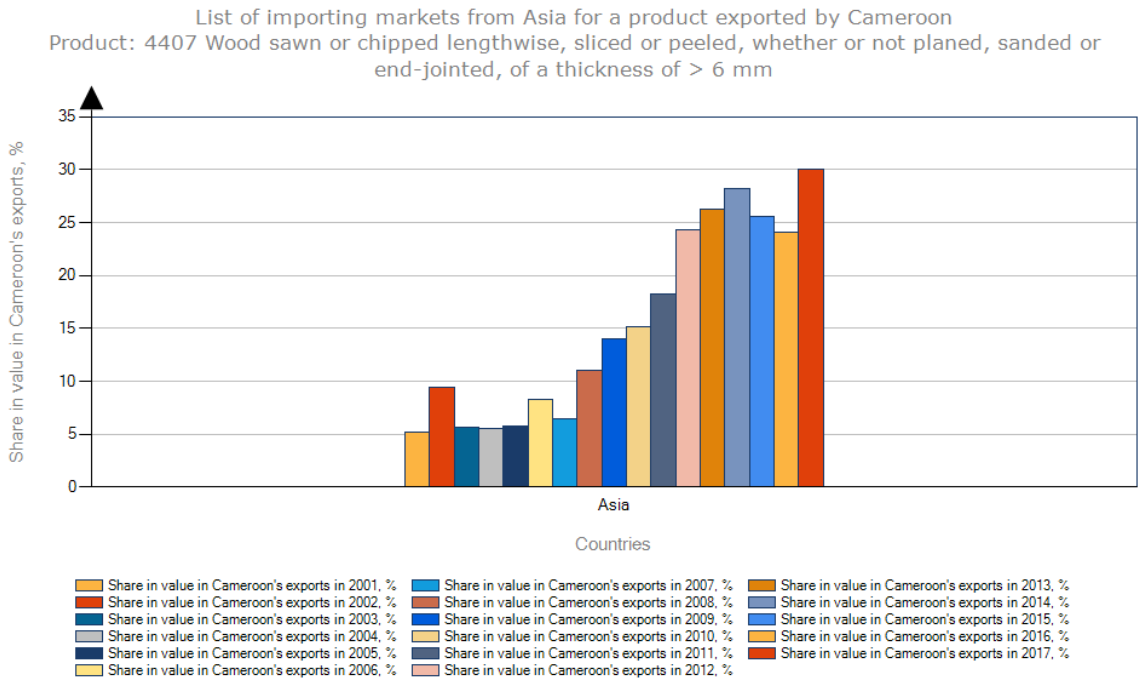


Figure 19. Evolution of Asia's imports of sawnwood in Cameroon from 2001-2017

Source: ITC UN COMTRADE https://www.trademap.org

Asia's share of sawnwood imports in Cameroon's total wood exports increased from 5% in 2001 to 30% in 2017.

4.5.5 New challenges of Sawnwood Exports

One of the obvious consequences of globalization affecting the world economy is that a nation's timber policies procurement policies is weighted and compared by international institution and transnational actors (Bernstein & Cashore 2000).

Civil societies and lobbies in Europe are more and more interested in the source of the raw materials used for their products, the labor conditions in the resource country**;** the environmental impact of logging extraction and indeed prefer sustainable channels for procurement, production and manufacturing (Atyi et al.2013)

In 2003, the European commission proposed the EU Forest Law Enforcement, Governance and Trade (FLEGT) which aimed at tackling illegal logging on European markets and the EU Timber Regulation (EUTR) which admitted the responsibilities of both wood buyers and sellers. The parties (exports countries and imports countries), therefore decided to sign

voluntary partnership agreements: one to offer sustainably managed wood production and the other party to buy only products provided with enough traceability level (European Commission 2003)

In 2010 Cameroon signed the voluntary partnership agreement (VPA) of the EUTR Action plan, and since then was engaged in a lot of processes aiming to provide FLEGT license for wood exports destined to Europe.

In 2019, Cameroon is still implementing FLEGT's VPA action plan; wood exports were influenced during this long process (Brusselaers &Buysse 2018), thus, the competitiveness of sawnwood's exports.

4.6 Conclusion

Forests in Cameroon are divided between permanent forest estate and non-permanent forest estate. Permanent forest estate is solely used for forestry and wildlife habitat (Cameroon forestry law 94).

The State of Cameroon is the principal forest owner in Cameroon (Foahom 2001). The management of permanent estate is made through allocation of concessions to logging companies. These logging companies are mostly National, French, Italian or Chinese owned.

Cameroon's wood production is mostly destined to exports. The principal wood exports destinations are Belgium, Italy and France in Europe, China and Vietnam in Asia, then, Senegal and Chad in Africa (ITC UN COMTRADE).

Cameroon's wood exports towards Europe generally decreased during the last years while it increased in Asia, Brusselaers &Buysse (2018) interpreted this shift as a trade distortion causing a redirection of trade flow due to the stringent export conditions on EU market. The same trend is observed with sawnwood exports. EU's imports share in Cameroon exports has reduce from 86% in 2001 to 59% in 2017, while Asia's import share has increased from 5% in 2001 to 30% in 2017.

As Cameroon's sawnwood exports experienced a redirection of trade flows from EU countries to Asia, the competitiveness of sawnwood exports in Cameroon was certainly influenced. Cameroon's exports of sawnwood will/or not remain competitive in the global international market despite the EU-Cameroon VPA policy.

5. RESULTS

5.1 Defining of Competitiveness (Step 1)

Based on the definition of competitiveness proposed by Laura D'andrea Tyson in point 2.3, **Competitiveness of the sawnwood industry in Cameroon** is defined as the ability of the industry to deliver goods that meets the international standards and competition while ensuring to the populations a standard of living which is both rising and sustainable.

5.2 Measuring Competitiveness (Step 2)

The data used to measure the competitiveness of sawnwood exports in Cameroon was gathered form UN-COMTRADE's website https://comtrade.un.org/; in the visualize data section, ITC trade map was chosen and redirected to https://www.trademap.org where the exports data was extracted.

Finally, there was a matrix of 10x17 representing:

on one side:

- Total exports of sawnwood of: the world, Cameroon, Finland, China and Ghana
- Total exports of: world, Cameroon, Finland, China and Ghana;

And on the other hand, the years under studies; that is from 2001 to 2017.

We mainly used Microsoft Excel to carry out the different Calculations and to simplify the presentation we used the following coding:

- When measuring the Balassa index, we used:

RCAcs	Balassa index of sawnwood in Cameroon
RCAfs	Balassa index of sawnwood in Finland
RCAchs	Balassa index of sawnwood in China
RCAgs	Balassa index of sawnwood in Ghana

- When calculating the Spearman rank correlation, we used:

SRC	Spearman rank correlation coefficient
Cmr	Cameroon

Fin	Finland
Gha	Ghana

As mentioned in point 3 above, the techniques used to measure the export competitiveness of Cameroon's sawnwood industry are the Balassa index or Revealed Comparative advantage index, the Revealed Symmetric Comparative Advantage, the Spearman Rank correlation coefficient and the Constant Market Share Analysis.

5.2.1 Revealed Comparative Advantage of Cameroon's Sawnwood Exports and Country-Specific RCA's Comparison

Refer to point 2.4.2.1 for a detailed description and formula for RCA.

An RCA value ranging between 0 and 1 indicates that Cameroon has a comparative disadvantage and an RCA superior to 1. This implies that the country has a comparative advantage. The data for world's total exports of sawnwood and the world's total exports is not available for the year 2001.

The following is a table compiling the RCA values of Cameroon, Finland, China and Ghana; then a chart describing the evolution of these RCA values from 2001-2017.

Table 2.RCA Values of Cameroon, Finland, China and Ghana.

years	RCAcs	RCAfs	RCAchs	RCAgs
2001	N/A*	N/A*	N/A*	N/A*
2002	8.37	9.35	0.13	N/A*
2003	9.54	10.46	0.16	11.8
2004	11.87	9.51	0.11	4.04
2005	40.12	8.77	0.11	12.99
2006	36.17	9.05	0.12	6.96
2007	32.66	10.22	0.11	15.19
2008	93.29	9.6	0.13	16.9
2009	64.45	10.78	0.14	7.28
2010	34.08	12.28	0.1	6.62
2011	77.14	12.47	0.1	4.02
2012	38.92	13.54	0.08	2.98
2013	32.76	14.32	0.07	9.84
2014	29.33	14.47	0.05	N/A*
2015	34.45	15.11	0.04	N/A*
2016	62.08	15.27	0.04	15.96
2017	36.85	14.53	0.03	3.14

*Data is not available

Source: Author's calculations

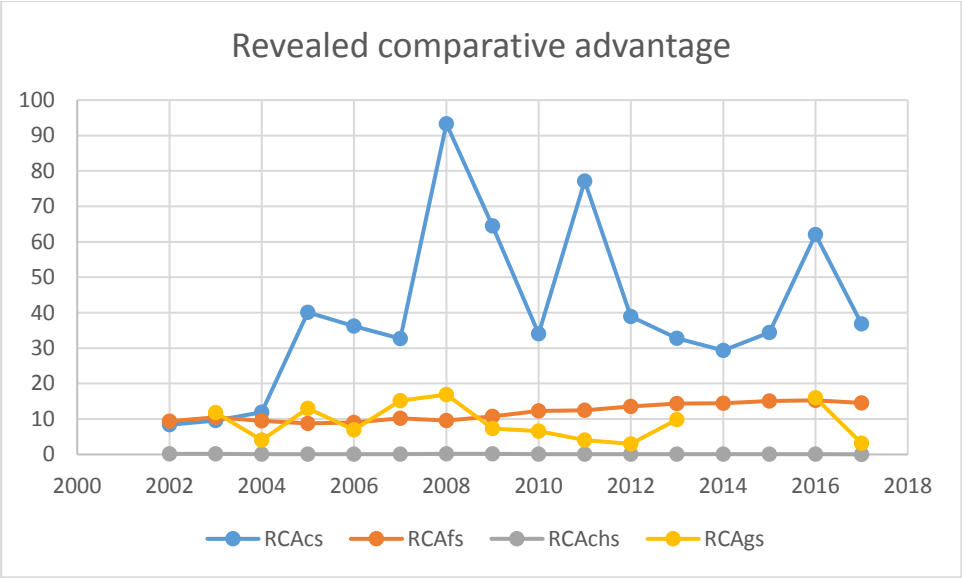


Figure 20. RCA values of Cameroon, Finland, China and Ghana from 2001-2017.

Source: Author's calculations.

Table 2 represents the RCA values of Cameroon, Finland, China and Ghana. The RCA of Cameroon for the period 2002-2017 generally ranges between 8.73 and 93.29; which means that Cameroon has a comparative advantage in exporting sawnwood during that period.

Cameroon has the highest value of revealed comparative advantage in exporting sawnwood from 2004 to 2017 (see Fig. 20).

Calculation of means (see appendix 2) suggests that Cameroon's comparative advantage in exporting sawnwood is, in an average 40 times superior to the average comparative advantage exports of sawnwood of other countries in the world.

In 2002, Finland has the highest value of RCA (see Table 2, Fig.20); appendix 2 shows that Finland has a mean comparative advantage 11 times above the average comparative advantage of the other countries in the world.

An analysis of China's revealed comparative advantage shows that during the period 2001-2017, the country had a comparative disadvantage in exporting sawnwood. The RCA values of China generally ranges between 0.03 and 0.16 (see Table 2).

In 2003, Ghana had the highest comparative advantage at exporting sawnwood. The RCA of Ghana was higher than Finland's during the years 2005, 2007, 2008.

From 2004, Cameroon has the highest comparative advantage compared to Finland, China and Ghana.

According to the critics around RCA (see point 2.4.2.1), the RCA index is asymmetric around its neutral value 1 therefore a histogram representation of the different RCAs results to a positive skewed distribution for Cameroon (see Fig. 21), Finland (see Fig. 22) and Ghana (see Fig. 24), and a negative skewed distribution for China (see Fig. 23).

The following figure is representation of a skewed distribution of the revealed comparative advantage values of Cameroon.

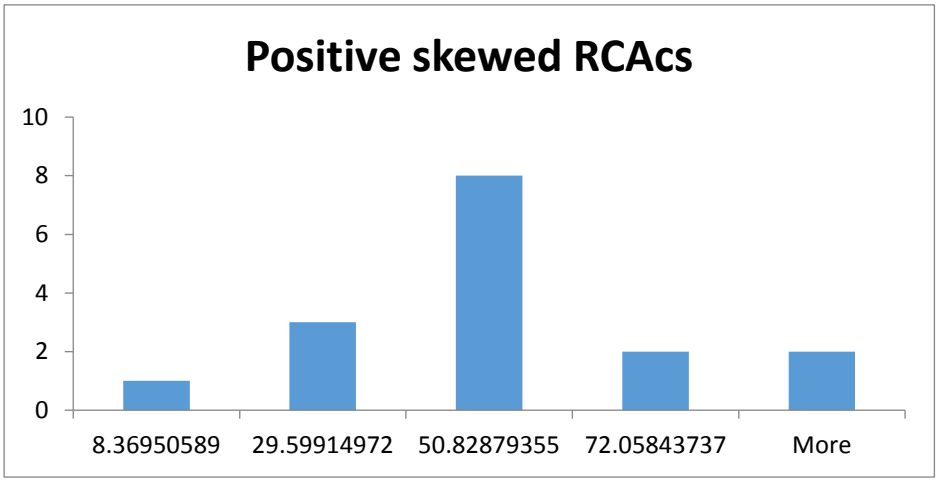


Figure 21. Positive skewed distribution of Cameroon's RCA.

Source: Author's calculations

RCA's indices of Cameroon range between 8.37 and 93.29. Cameroon has a comparative advantage at exporting sawnwood. A skewed distribution of Cameroon's RCA results to a positive and asymmetric distribution at the right of the neutral value which is 1.

The following figure is a representation of a skewed distribution of the revealed comparative advantage indices of Finland.

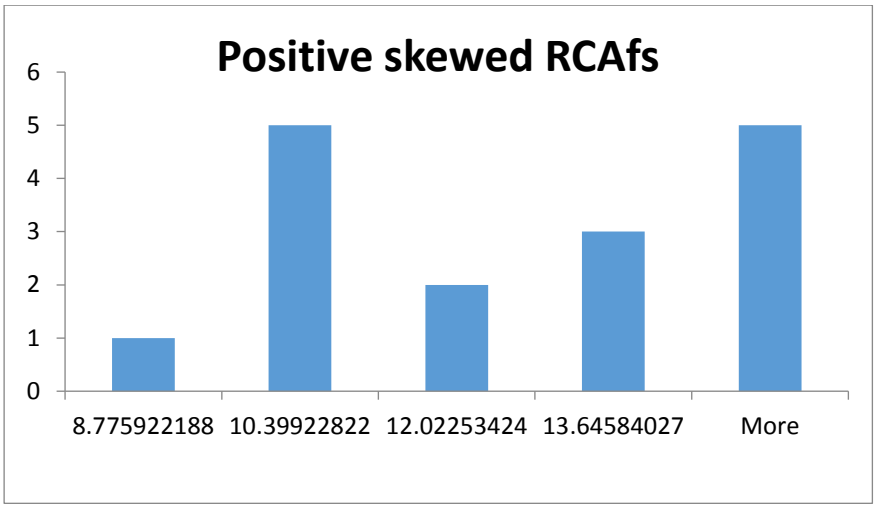


Figure 22. Positive skewed distribution of Finland's RCA.

Source: Author's calculations

Finland's RCA indices from 2001-2017 ranges between 8.77 and 15.27. Finland has a comparative advantage at exporting sawnwood. A skewed distribution of Finland's RCA indices shows a positive and asymmetric distribution at the right of the neutral value 1.

The following figure is representation of a skewed distribution of the revealed comparative advantage values of China.

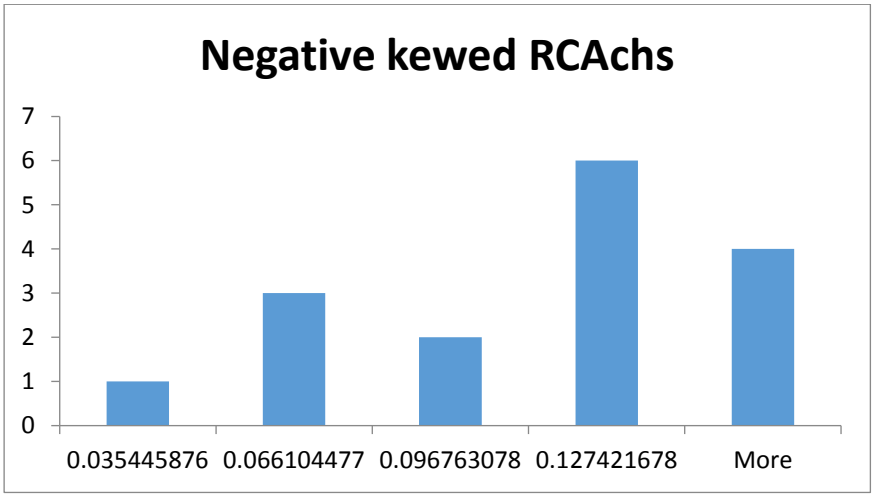


Figure 23. Negative skewed distribution of China's RCA.

Source: Author's calculations

China’s RCA indices from 2001-2017 ranges between 0.03 and 0.16. China has a comparative disadvantage at exporting sawnwood. A skewed distribution of China’s RCA indices shows a negative distribution to the left of the neutral value 1.

The following figure is representation of a skewed distribution of the revealed comparative advantage values of Ghana.

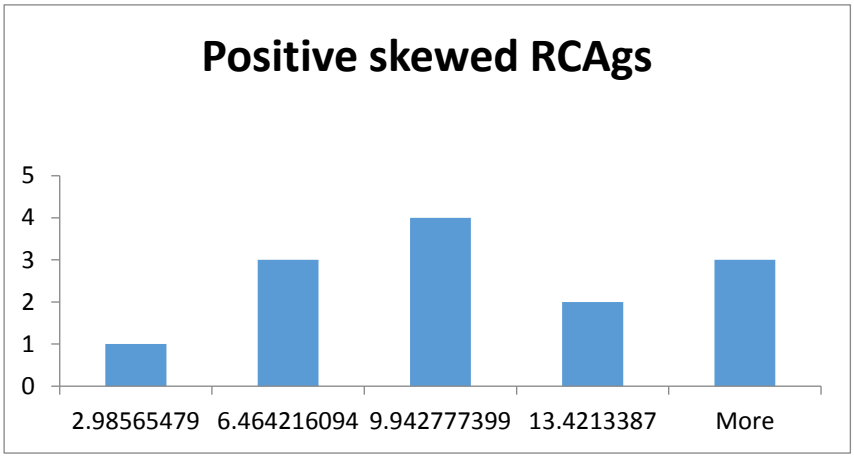


Figure 24. Positive skewed distribution of Ghana's RCA.

Source: Author’s calculations

Ghana’s RCA indices from 2001-2017 ranges between 3.14 and 16.0. Ghana has a comparative advantage at exporting sawnwood. A skewed distribution of Ghana’s RCA indices shows and a positive and asymmetric distribution at the right of the neutral value 1.

5.2.2 Comparisons Between RSCA of Cameroon, Finland, China and Ghana

The Revealed symmetric Comparative advantage eases the interpretations of RCA calculations by allowing a symmetry of the RCA around the neutral value 0 (see point 2.4.2.1).
The RSCA ranges between -1 and 1. A country has a comparative advantage if its RSCA is positive and a monopoly if it RSCA equal 1. A negative RSCA denotes a comparative disadvantage.

The following is a table compiling the RSCA values of Cameroon, Finland, China and Ghana from 2001 to 2017.

Table 3. RSCA Values of Cameroon, Finland, China and Ghana from 2001-2017.

years	RSCAcs	RSCAfs	RSCAchs	RSCAgs
2001				N/A*
2002	0.79	0.81	-0.77	N/A*
2003	0.81	0.82	-0.73	0.84
2004	0.84	0.81	-0.81	0.6
2005	0.95	0.79	-0.79	0.86
2006	0.95	0.8	-0.78	0.75
2007	0.94	0.82	-0.78	0.88
2008	0.98	0.81	-0.76	0.89
2009	0.97	0.83	-0.76	0.76
2010	0.94	0.85	-0.81	0.74
2011	0.97	0.85	-0.82	0.6
2012	0.95	0.86	-0.84	0.5
2013	0.94	0.87	-0.87	0.81
2014	0.93	0.87	-0.89	N/A*
2015	0.94	0.87	-0.92	N/A*
2016	0.97	0.88	-0.93	0.88
2017	0.95	0.87	-0.93	0.52

* Data is not available

Source: Author's calculations

From 2001 to 2017, the RSCA of Cameroon is positive and comprises between 0.79 and 0.97(see Table 3), meaning that Cameroon has a comparative advantage and is highly specialized in exporting sawnwood compared to the average sawnwood exporter country in the world.

From 2004, Cameroon has the highest comparative advantage compared to Finland, China and Ghana. Finland was the most specialized in exporting sawnwood in 2002 and 2003.China has a comparative disadvantage since its RSCA is negative, it ranges between -0.93 and - 0.77 (see Table 3).

The following is a chart highlighting the symmetry of RSCA of Cameroon, Finland, China and Ghana around the neutral value 0.

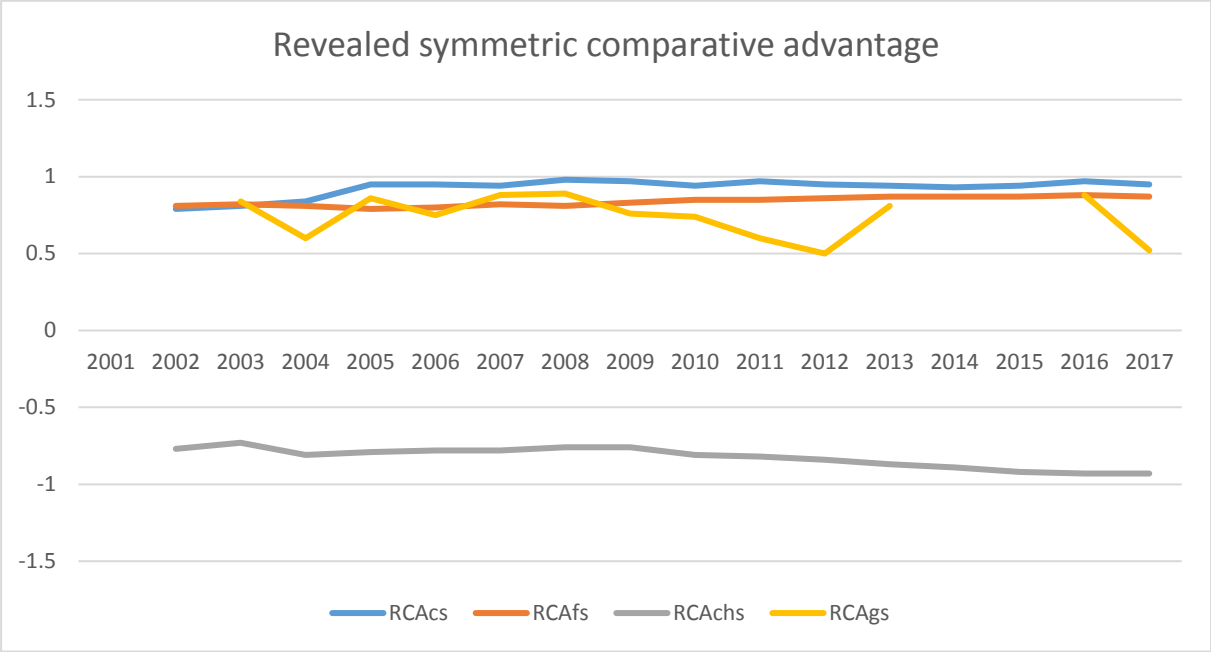


Figure 25. RSCA values of Cameroon, Finland, China and Ghana.

Source: Author's calculations

Cameroon, Finland and Ghana have a comparative advantage in exporting sawnwood; this is explained by a positive distribution of their RSCA above the neutral value 0 (see fig.25). China does not have a comparative advantage at exporting sawnwood, A representation of its RSCA values shows a negative distribution under the neutral value 0.

5.2.3 The Spearman Rank Correlation (SRC) of Cameroon, Finland, China and Ghana

5.2.3.1 SRC of Cameroon, Finland, China and Ghana Calculated Across Years

The spearman rank correlation indicates if there is a change or not in the structure of comparative advantage of a country. A spearman rank coefficient tending to -1 indicates a structural change while, a coefficient tending to 1 implies no structural change. A spearman rank correlation of 0 indicates an absence of relationship between the variables studied.

The proceeding is a table describing the spearman rank correlation coefficient of Cameroon, Finland, China and Ghana calculated across years from 2001-2017

Table 4. SRC of Cameroon, Finland, China and Ghana calculated across years.

Countries	Cameroon	Finland	China	Ghana
SRC	0.5	0.9	0.8	0.6

Source: Author's calculations

Table 4 tells that the SRC of Cameroon is 0.5; this coefficient can be interpreted as the presence of fluctuations of comparative advantage across the year though an absence of structural change.

The spearman rank correlation calculated across the years indicates that, for Finland and China, with a coefficient close to 1, that is respectively 0.9 and 0,8 (see table 4); the structural changes in comparative advantage have been the less dynamics. In other words, the comparative advantage of Finland and China, remained steady across the years with very few variations. This is an indication that the two country can maintain their rank and position on the global market of sawnwood exports.

Finally, Ghana's SRC is 0.6 (see table 4); this coefficient indicates a positive relationship in the change of comparative advantage during years, but no structural change.

5.2.3.2 SRC Calculated across Countries

As the spearman rank correlation is calculated across countries, a coefficient of -1 indicate a perfect different pattern of comparative advantage; in other words, a stronger complementarity among the country. An SRC coefficient of 1 indicates a perfect similar pattern of comparative advantage or a stronger competition between the countries involved.

Finally, if the SRC is 0, it implies that there is no relationship between the countries.

The following is a table describing the spearman rank correlation coefficient calculated across countries between: Cameroon- Finland, Cameroon-China and Cameroon-Ghana.

Table 5. SRC of Cameroon, Finland, China and Ghana calculated across countries.

Country	Finland	China	Ghana
Cameroon	0.3	0.1	0.5

Source: Author's calculations

The SRC between Cameroon and Finland gives a coefficient of 0.3 (see table 5) there is a positive but weak competition between Cameroon and Finland.
Table 6 allows to conclude that between Cameroon and China, there is almost no relationship between the comparative advantages of the two countries since the spearman rank coefficient is 0.1.
The spearman rank coefficient between Cameroon and Ghana is 0.5, (see table 5) indicates a stronger competition between Cameroon and Ghana compare to Finland. Ghana and Cameroon have a more similar pattern of comparative advantage. They both export tropical sawnwood, their product can be substituted, and their economies are comparable.

5.2.3 The Constant Market Share Analysis of Cameroon

The constant market share of a country can be decomposed into different components:
The world growth effect in the export of a country, the commodity effect in market share and the competitiveness effect. Refer to point 2.4.2.2 for more details and formula.

The following is a table describing the market share analysis of Cameroon.

Table 6. Constant Market Share of Cameroon's sawnwood exports.

period	increase in export	general rise in world export	commodity composition	Residual error	competitiveness
2001–2005					
2006–2009	683976	1384114	– 72652	– 774335	146850
	(100 %)	(202.36 %)	(-10.62 %)	-113.21 %)	(21.47 %)
2010–2013	789013	874925	– 87258	– 63302	– 61956
	(100 %)	(110.89 %)	(-11.06 %)	(8.02 %)	(-7.85 %)
2014–2017	762050	– 88930	42045	770712	38223
	(100 %36)	(-11.67 %)	(5.52 %)	(101.14 %)	(5.01 %)

Source: United Nations Commodity Trade Statistics Database, calculated by author

Table 6 shows the results of the CMS analysis of Cameroonian sawnwood exports over 3 periods.

- **During the Period 2006-2009**

The increase in Cameroon's sawnwood export was caused by a general rise in the world exports (202.36%) and the competitiveness (21.47%).

The negative value of the commodity composition (-10.62 %) means that Cameroon's sawnwood exports growth rate was lower than the world average.

The residual error represents the others export commodities in Cameroon or the market distribution effect.

A negative value of the residual error (-113.21 %) means that the exports of other commodities in Cameroon have a growth rate lower than the world average or that the markets where Cameroon exports its sawnwood have a growth rate lower than the world average. This can be explained by the financial crisis of 2008 which affected import and international trade.

The positive value of competitiveness means that Cameroon sawnwood export has been more competitive in 2006-2009 compared to the world average.

- **During the Period 2010-2013**

Table 6 also shows that the general increase in Cameroon sawnwood export during the period 2010-2013 was due to an increase in the world export (110.89%) and an increase (8.02%) in other export commodities or because Cameroon's sawnwood was exported on markets with a higher growth rate than the world average. Cameroon has been less competitive in exporting sawnwood (-7.85 %) compared to the world average and the exports of sawnwood have grown at a lower rate (-11.06 %) compared to the world average. The decrease in the competitiveness and in the sawnwood export performance is due to the apprehension of Cameroon sawnwood industry towards the signature in 2010 of the voluntary partnership agreement of the EU's forest law enforcement, governance and trade; and the consequence of its implementation which started in December 2011(EU FLEGT facility). In fact, the engagement of Cameroon in a process that would lead to the issue of verified legal timber products certification by FLEGT licences will either fully open the EU market to Cameroon's sawnwood or close it. This uncertainty has certainly stressed negatively Cameroon's sawnwood export performance during the period 2010-2013.

- **During the Period 2014-2017**

The world export growth rate has decreased (-11.67 %); the rise in Cameroon's export of sawnwood at the time is therefore due to an increase in the commodity composition (5.52 %), an increase in the exports of other commodities or in import markets (101.14 %) and increase in the competitiveness (5.01 %). Cameroon's sawnwood export industry remained competitive and has not been influenced by the world's exports trend.

6. DISCUSSION AND CONCLUSION

6.1 Resume

6.1.1 RCA AND RSCA Indexes

Revealed Comparative advantage analysis of shows that Cameroon has a comparative advantage in exporting sawnwood during the period 2001-2017 with an RCA ranging between 8.37 and 93.29.

Finland and Ghana also have comparative advantage at exporting sawnwood, but Cameroon has the highest RCA.

China has a comparative disadvantage at exporting sawnwood since its RCA ranges between 0.03 and 0.16; this is explained by the fact that China's national demand of sawnwood is very high, therefore the country mostly focuses on satisfying its interior market. China is mostly a net importer of sawnwood.

The Revealed symmetric comparative advantage analysis from 2001-2017 also confirm that Cameroon has a comparative advantage in exporting sawnwood and helps to conclude that the country is the highest specialized in sawnwood exports compared to Finland and Ghana with RCSA values ranging between 0.79 and 0.97. The analysis also confirms the RCA results stating that China has a comparative disadvantage in exporting sawnwood.

6.1.2 Spearman Rank Correlation Coefficient

6.1.2.1 SRC Calculated Across Years

The Spearman rank correlation coefficient of Cameroon's comparative advantage calculated across years is 0.5; this coefficient shows that there is more or less a correlation between Cameroon competitive performance across years. that the performance of Cameroon sawnwood exports years after year is slightly continuous,

Finland and China, on the contrary of Cameroon shows a steadiness across the years in their performance at exporting sawnwood: Finland's and China's SRC coefficient calculated across years is respectively 0.9 and 0.8; the countries can maintain their rank and position on the international sawnwood market.

Ghana's SRC coefficient is 0.6, conclusion can be made that Ghana's competitive performance in exporting sawnwood is steadier than Cameroon's across years.

6.1.2.2 SRC Calculated Across Countries

The SRC calculated across country shows that there is a slight competition between Cameroon and Finland; their SRC coefficient is 0.29; this is certainly because both countries export different type of sawnwood (soft sawnwood for Finland and tropical hard sawnwood for Cameroon) thus making their products not substitutable.

The SRC coefficient between Cameroon and Ghana is 0.5. The competition is therefore harsher between Cameroon and Ghana compare to Finland; the reason is that Cameroon and Ghana both export on same markets almost same kind of product which is tropical sawnwood.

The last result of SRC analysis shows an SRC coefficient of 0.1 between Cameroon and China. The conclusion is that is no competitive relationship between Cameroon and China. The two countries are not competitors.

6.1.3 Constant Market Share Analysis of Cameroon

The constant market share analysis allows to conclude that the rise in Cameroon's export was due to the general rise of the world export for the periods 2006-2009 and 2010-2013. The competitiveness performance explained the rise in exports of Cameroon for 21% during the period 2006-2009 and for 5% from 2014-2017. For the period 2010-2013 Cameroon was less competitive in exporting sawnwood compare to the world average sawnwood exporter; this under performance can be a setback caused by the engagement of Cameroon in the voluntary partnership agreement of the EU's Forest Law Enforcement, Governance and trade banning from EU markets illegal loggings.

Cameroon's rise in export for the period 2014-2017 is explained by a rise in commodity composition, competition and mostly a rise in what we have called a residual. The residual error represents either Cameroon's export commodities or the effect of a growing distribution market. Suggestion will be that the residual error represents the growing market distribution; the reason is that: as stated in point **4.5.4** of this study, Asia and China in particular is becoming a preferred destination for Cameroon's sawnwood.

6.2 Discussion

Cameroon's Sawnwood export industry is highly competitive on the global market. The country is the most specialized at exporting sawnwood compared to Finland, Ghana and China. This specialization is explained by the abundance of forests resources, that is, the presence at low prices of factors of production. Logging companies exporting Cameroon's sawnwood have been exporting since 1960s. They therefore have acquired deep knowledge of the national sawnwood industry and have been able to improve technologies and managements practices to remain competitive on the international market.

the government of Cameroon is also an actor in the positive competitive performance of Cameroon. New National forest policies and laws have also encouraged sustainable exports of sawnwood in Cameroon. In 2010, Cameroon's government took the initiative to get engage into the FLEGT's VPA which leads or will lead to change in the management practices and allows the country to meet management standards set by international partners such as EU.

Though Cameroon's sawnwood export has a positive competitive performance on global market, this performance remains unstable across the years. Cameroon's sawnwood export industry shows a great sensitivity or febrility to market conditions or to policies and regulations which can change from one year to another and thus induce changes in comparative advantage of the country across years. Cameroon's sawnwood export industry also has difficulties to maintain the same production capacity or to maintain for each year the same exports standards. The country is not able to capitalize on its long experience as sawnwood exporter to have a minimum control over the market. The country's sawnwood industry has a very few influenced on the global sawnwood market and therefore does not possess the stability and the control over the market characterizing leaders on a market or a country having a monopole on a market.

The competitiveness of Cameroon's sawnwood exports is very fluctuating and highly dependent on external factors such as the global demand and price, or international policies, law and regulations. Cameroon is not strong enough on the global market to influence the trend of sawnwood exports.

On the contrary of Cameroon, Finland can maintain a high level of competitiveness on the sawnwood export global market and at the same time maintain this performance across the years. Finland and Cameroon are not direct competitors when exporting sawnwood on the global market. The reason is that both countries sell sawnwood product which are not substitutable. The aim for Cameroon's sawnwood export industry will be to remain as competitive as today and to maintain such performance on the long run.

Ghana like Cameroon is competitive on the global market at exporting sawnwood. Ghana's competitive performance is also like Cameroon's highly influenced by external factors such as the global demand and price or international policies and regulation.

China is not a competitive sawnwood exporter on the global market and at the difference of Ghana is not a competitor of Cameroon on the global sawnwood market. The SRC coefficient of 0.8 indicates that China has not changed it exports policy. That is, china has continued to import sawnwood more than it exports over the years. As presented in point **4.5.4**, Sawnwood demand in China is growing and on the contrary of EU's market there is no imminent risk of ban of Cameroon's sawnwood products on China's market. Cameroon's logging companies are in a process of conquering Asia's market and reducing their dependence on EU's importers. Though European countries such as Belgium and Italy are still important partners, it's important for Cameroon to conclude successfully the implementation of the FLEGT's VPA and with the deliverance of FLEGT's license to guaranty for its sawnwood products an open access to EU's market.

6.3 Recommendation (STEP 3)

The struggle of Cameroon to comply with the EU timber regulation and its impact on Cameroon's competitive performance highlight the dependence of the country on international law and regulations or on external factors in general.

As Cameroon is trying to diversify its distribution market portfolio by increasing its exports to Asia. It is also important for the country to improve its technologies and management practices. FLEGT's implementation plan in Cameroon already included this aspect but it has proven not to be enough so far. A full dedication of the stakeholders at every level of the production chain in improving the national standard of production is necessary to trigger the country's competitiveness on the international market.

6.4 Conclusion

Cameroon's sawnwood export industry is a driver to economic growth and a generator of positive impact on the development of the country. Though the sawnwood export industry is competitive on the global market, the country is not able to maintain such performance across

the years because of its dependence on external factors such as global demand and price and international law and policies.

In order to reduce its dependence on EU's import market, Cameroon has redirected its exports trade flows towards China which impose less stringent exports policies than EU.

Nevertheless, Cameroon will need to improve its production technologies and management policies to maintain it competitive performance on the long run.

An assessment of the national sawnwood or wood industry with a focus on technologies and their impact on the national production will provide a good starting point.

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APPENDIX 1

RCA Calculations

YEARS	Exported value in 2001	Exported value in 2002	Exported value in 2003	Exported value in 2004	Exported value in 2005	Exported value in 2006	Exported value in 2007	Exported value in 2008
RCACS	n/a	8.36950589	9.54414151	11.8700478	40.11932175	36.17278389	32.65936471	93.2880812
RCAfs	n/a	9.34989939	10.46308685	9.50690585	8.775922188	9.055489606	10.21509396	9.596381506
RCAchs	n/a	0.12976103	0.158080279	0.10700124	0.11543195	0.123130849	0.11355546	0.134119557
RCAgs	n/a	n/a	11.79895728	4.04513478	12.99393733	6.962125099	15.19277565	16.89990001

Exported value in 2009	Exported value in 2010	Exported value in 2011	Exported value in 2012	Exported value in 2013	Exported value in 2014	Exported value in 2015	Exported value in 2016	Exported value in 2017
64.4492267	34.07708135	77.1373109	38.9194979	32.764802	29.3353435	34.4462677	62.0757571	36.8457415
10.78144159	12.2779869	12.4750032	13.5368082	14.3242741	14.4729995	15.1137657	15.2691463	14.5321335
0.13687502	0.102736579	0.09748523	0.08514488	0.06995706	0.05558443	0.03899361	0.03685657	0.03544588
7.279029041	6.621503551	4.02352833	2.98565479	9.84494976	n/a	n/a	15.9629056	3.14026096

Source: United Nations Commodity Trade Statistics Database calculated by author.

APPENDIX 2

RCA Data Analysis

RCAcs		RCAfs		RCAchs		RCAgs	
Mean	40.12964	Mean	11.85915	Mean	0.09626	Mean	9.057743
Standard Error	5.893021	Standard Error	0.59782	Standard Error	0.009693	Standard Error	1.401222
Median	35.30953	Median	11.52971	Median	0.104869	Median	7.279029
Mode	#N/A	Mode	#N/A	Mode	#N/A	Mode	#N/A
St Deviation	23.57208	St Deviation	2.391281	St Deviation	0.038774	St Deviation	5.052178
Sample Variance	555.6432	Sample Variance	5.718227	Sample Variance	0.001503	Sample Variance	25.5245
Kurtosis	0.485003	Kurtosis	-1.72438	Kurtosis	-0.99698	Kurtosis	-1.45266
Skewness	0.814737	Skewness	0.172331	Skewness	-0.3672	Skewness	0.31359
Range	84.91858	Range	6.493224	Range	0.122634	Range	13.91425
Minimum	8.369506	Minimum	8.775922	Minimum	0.035446	Minimum	2.985655
Maximum	93.28808	Maximum	15.26915	Maximum	0.15808	Maximum	16.8999
Sum	642.0743	Sum	189.7463	Sum	1.54016	Sum	117.7507
Count	16	Count	16	Count	16	Count	13

Source: author's calculations

APPENDIX 3

RSCA Data Analysis

RCAcs		RCAfs		RCAchs		RCAgs	
Mean	0.92625	Mean	0.838125	Mean	-0.82438	Mean	0.740769
Standard Error	0.014602	Standard Error	0.007484	Standard Error	0.016304	Standard Error	0.038952
Median	0.945	Median	0.84	Median	-0.81	Median	0.76
Mode	0.95	Mode	0.87	Mode	-0.81	Mode	0.6
St. Deviation	0.058409	St. Deviation	0.029937	St. Deviation	0.065214	St. Deviation	0.140443
Sample Variance	0.003412	Sample Variance	0.000896	Sample Variance	0.004253	Sample Variance	0.019724
Kurtosis	1.455854	Kurtosis	-1.59439	Kurtosis	-1.02532	Kurtosis	-1.05983
Skewness	-1.63315	Skewness	-0.08312	Skewness	-0.50996	Skewness	-0.65996
Range	0.19	Range	0.09	Range	0.2	Range	0.39
Minimum	0.79	Minimum	0.79	Minimum	-0.93	Minimum	0.5
Maximum	0.98	Maximum	0.88	Maximum	-0.73	Maximum	0.89
Sum	14.82	Sum	13.41	Sum	-13.19	Sum	9.63
Count	16	Count	16	Count	16	Count	13

Source: author's calculations

APPENDIX 4

Spearman rank correlation

- Calculated across years

SRC of Cameroon.

Cameroon	
$\sum di^2$	441
n	17
n^2	289
n^2-1	288
$n(n^2-1)$	4896
RS**Cmr=**1-	
0.540441176	
RSCmr=0.459558824	

	ACCROSS Cameroon	YEARS	(ta-tb)	
years	**RSCAcs**	**rank**	**d(ta-tb)**	**d^2**
2001				
2002	0.7865	16		
2003	0.8103	15	1	1
2004	0.8446	14	1	1
2005	0.9514	5	9	81
2006	0.9462	8	-3	9
2007	0.9406	12	-4	16
2008	0.9788	1	11	121
2009	0.9694	3	-2	4
2010	0.943	10	-7	49
2011	0.9744	2	8	64
2012	0.9499	6	-4	16
2013	0.9408	11	-5	25
2014	0.934	13	-2	4
2015	0.9435	9	4	16
2016	0.9652	4	5	25
2017	0.9471	7	-3	9

Source: Author’s calculations

SRC OF FINLAND

Finland	
$\sum di^2$	75
n	17
n^2	289
n^2-1	288
$n(n^2-1)$	4896
RSFin = 1- 0.091911764	
RSFin= 0.908088236	

Source: Author‘s calculations

ACCROSS YEARS (ta-tb) Finland				
years	**RSCAfs**	**rank**	**d(ta-tb)**	**d^2**
2001				
2002	0.8068	14		
2003	0.8255	10	4	16
2004	0.8096	13	-3	9
2005	0.7954	16	-3	9
2006	0.8011	15	1	1
2007	0.8217	11	4	16
2008	0.8112	12	-1	1
2009	0.8302	9	3	9
2010	0.8494	8	1	1
2011	0.8516	7	1	1
2012	0.8624	6	1	1
2013	0.8695	5	1	1
2014	0.8707	4	1	1
2015	0.8759	2	2	4
2016	0.8771	1	1	1
2017	0.8712	3	-2	4

Source: author’s calculations

SRC OF CHINA

China	
$\sum di^2$	140
n	17
n^2	289
n^2-1	288
$n(n^2-1)$	4896
RSCh = 1-	
0.171568627	
RSCh= 0.828431372	

Source: Author‘s calculations

ACCROSS YEARS (ta-tb) China				
years	**RSCAChs**	**rank**	**d(ta-tb)**	**d^2**
2001				
2002	-0.7702	4		
2003	-0.727	1	3	9
2004	-0.8066	8	-7	49
2005	-0.793	6	2	4
2006	-0.7807	5	1	1
2007	-0.796	7	-2	4
2008	-0.7635	3	4	16
2009	-0.7592	2	1	1
2010	-0.8137	9	-7	49
2011	-0.8223	10	-1	1
2012	-0.8431	11	-1	1
2013	-0.8692	12	-1	1
2014	-0.8947	13	-1	1
2015	-0.9249	14	-1	1
2016	-0.9289	15	-1	1
2017	-0.9315	16	-1	1

Source: Author’s calculations

SRC of Ghana.

Ghana	
$\sum di^2$	296
n	17
n^2	289
n^2-1	288
$n(n^2-1)$	4896
RSCh = 1- 0.32745098	
RSGha= 0.637254902	

Source: Author's calculations

ACCROSS YEARS (ta-tb) Ghana				
years	**RSCAgs**	**rank**	**d(ta-tb)**	**d^2**
2001				
2002				
2003	0.8437	5		
2004	0.6035	10	-5	15
2005	0.8571	4	6	36
2006	0.7488	8	-4	16
2007	0.8765	3	5	25
2008	0.8883	1	2	4
2009	0.7584	7	-6	36
2010	0.7376	9	-2	4
2011	0.6019	11	-2	4
2012	0.4982	13	-2	4
2013	0.8156	6	6	36
2014		#N/A*		
2015		#N/A*		
2016	0.882	2	4	16
2017	0.5169	12	-10	100

* means that data is not available for this year

Source: Author's calculations

- Spearman rank correlation across country

SRC between Cameroon and Finland.

Cmr- Fin	
∑di²	578
n	17
n²	289
n²-1	288
n(n²-1)	4896
RS = 1-	
0.70833333	
RS= 0.29166666	

Source: Author‘s calculations.

SRC between Cameroon and Finland

years	RCAcs	RCAfs	rank Cmr	rank Fin	d	d²
2001						
2002	0.7865	0.8068	16	14	2	4
2003	0.8103	0.8255	15	10	5	25
2004	0.8446	0.8096	14	13	1	1
2005	0.9514	0.7954	5	16	-11	121
2006	0.9462	0.8011	8	15	-7	49
2007	0.9406	0.8217	12	11	1	1
2008	0.9788	0.8112	1	12	-11	121
2009	0.9694	0.8302	3	9	-6	36
2010	0.943	0.8494	10	8	2	4
2011	0.9744	0.8516	2	7	-5	25
2012	0.9499	0.8624	6	6	0	0
2013	0.9408	0.8695	11	5	6	36
2014	0.934	0.8707	13	4	9	81
2015	0.9435	0.8759	9	2	7	49
2016	0.9652	0.8771	4	1	3	9
2017	0.9471	0.8712	7	3	4	16

Source: Author’s calculations

SRC Between Cameroon- China

Cmr- Ch	
$\sum di^2$	734
n	17
n^2	289
n^2-1	288
$n(n^2-1)$	4896
RS = 1- 0.80885098	
RS= 0.1005	

Source: Author's calculation

years	RCAcs	RCAChs	rank Cmr	rank Ch	d	d^2
2001						
2002	0.7865	-0.7702	16	4	12	144
2003	0.8103	-0.727	15	1	14	196
2004	0.8446	-0.8066	14	8	6	36
2005	0.9514	-0.793	5	6	-1	1
2006	0.9462	-0.7807	8	5	3	9
2007	0.9406	-0.796	12	7	5	25
2008	0.9788	-0.7635	1	3	-2	4
2009	0.9694	-0.7592	3	2	1	1
2010	0.943	-0.8137	10	9	1	1
2011	0.9744	-0.8223	2	10	-8	64
2012	0.9499	-0.8431	6	11	-5	25
2013	0.9408	-0.8692	11	12	-1	1
2014	0.934	-0.8947	13	13	0	0
2015	0.9435	-0.9249	9	14	-5	25
2016	0.9652	-0.9289	4	15	-11	121
2017	0.9471	-0.9315	7	16	-9	81

Source: Author's calculations

SRC between Cameroon and Ghana

Cmr- Gha	
$\sum di^2$	399
n	17
n^2	289
n^2-1	288
$n(n^2-1)$	4896
RS = 1-0.4889706	
RS= 0.511029	

Source: Author‘s calculations

years	RCAcs	RCAgs	rank Cmr	rank Gha	d	d^2
2001						
2002	0.7865		16			
2003	0.8103	0.8437	15	5	10	100
2004	0.8446	0.6035	14	10	4	16
2005	0.9514	0.8571	5	4	1	1
2006	0.9462	0.7488	8	8	0	0
2007	0.9406	0.8765	12	3	9	81
2008	0.9788	0.8883	1	1	0	0
2009	0.9694	0.7584	3	7	-4	16
2010	0.943	0.7376	10	9	1	1
2011	0.9744	0.6019	2	11	-9	81
2012	0.9499	0.4982	6	13	-7	49
2013	0.9408	0.8156	11	6	5	25
2014	0.934		13	#N/A*		
2015	0.9435		9	#N/A*		
2016	0.9652	0.882	4	2	2	4
2017	0.9471	0.5169	7	12	-5	25

* means that data is not available for this year

Source: Author’s calculations

APPENDIX 5

Constant Market Share of Cameroon

Unit: US Dollar thousand

PERIOD	0	1	2	3
TOTAL WORLD EXPORT EXCL CMR	2001-2005	2006-2009	2010-2013	2014-2017
	6422582517	11952680138	18865226689	18861332599
	7483920409	13828111938	15090435090	16420411492
	9097520129	15976124712	18081234805	15876865636
	10338009760	12346903998	18384023401	17539173403
MEAN	**8335508204**	**13525955197**	**17605229996**	**17174445783**

Source: United Nations Commodity Trade Statistics Database, calculated by author

Growth rate of world's export (%)				
period	0	1	2	3
	2001-2005	2006-2009	2010-2013	2014-2017
g		0.62	0.3	-0.024

Source: United Nations Commodity Trade Statistics Database, calculated by author

X_a Mean Total export of Cameroon Unit: US Dollar thousand				
period	0	1	2	3
	2001-2005	2006-2009	2010-2013	2014-2017
X_a	2232442	2916418	3705431	4467481

Source: United Nations Commodity Trade Statistics Database, calculated by author.

g_a	export growth rate of Cameroon (%)			
period	0	1	2	3
	2001-2005	2006-2009	2010-2013	2014-2017
g_a		0.306	0.27	0.205

Source: United Nations Commodity Trade Statistics Database, calculated by author

Unit: US Dollar thousand

PERIOD	0	1	2	3
TOTAL WORLD EXPORT OF SAWNWOOD EXCL. CMR	2001-2005	2006-2009	2010-2013	2014-2017
	22419125	32486911	28478890	37467754
	23967013	35532355	31464205	32689691
	29273377	30455462	30911944	34350997
	30284372	23520107	34979229	38175534
MEAN	**26485972**	**30498709**	**31458567**	**35670994**

world sawnwood export growth rate (%) (gi)				
period	0	1	2	3
	2001-2005	2006-2009	2010-2013	2014-2017
g_i		0.15	0.031	0.13

Source: United Nations Commodity Trade Statistics Database, calculated by author

X_{ia}	Mean Sawnwood export of Cameroon			
period	0	1	2	3
	2001-2005	2006-2009	2010-2013	2014-2017
X_{ia}	154579	324378	273021	347047

Source: United Nations Commodity Trade Statistics Database, calculated by author

g_{ia}	sawnwood export growth rate of Cameroon (%)			
period	0	1	2	3
	2001-2005	2006-2009	2010-2013	2014-2017
g_{ia}		1.1	-0.16	0.27

Source: United Nations Commodity Trade Statistics Database, calculated by author